

# Modern Refrigeration & Air Control

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SEP 2 1958  
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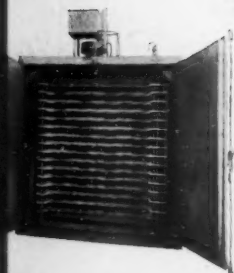
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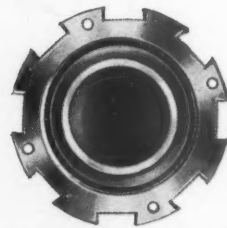
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# MODERN REFRIGERATION

*and Air Control News*

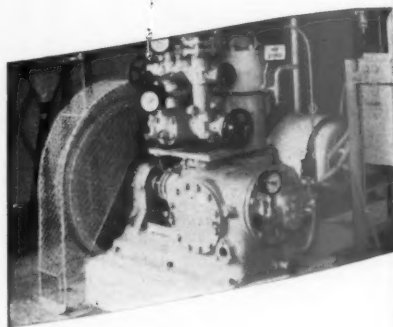


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## Contents

Editorial	870
News of the Month	872
Picture of the Month	873
Immersion Freezing of Turkeys	874
New Storage Capacity at Ports	879
Refrigeration Controls—9	881
Shop Refrigeration	891
Refrigerated Road Transport Review	894
Institute of Refrigeration Bulletin	902
Commercial and Industrial Section	904
Books on Refrigeration	910
Australian News Letter	919
"Passing Off" by Lord Meston	923
Patents	924



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## MODERN REFRIGERATION *Overseas*

The world-wide circulation of this, the original and oldest journal of the British Refrigeration Industry, carries "MODERN REFRIGERATION" by postal subscription into the following countries:—

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September . 1958

VOLUME 61

NUMBER 726

## Editorial . . . .

### Fridges' "Social Angle"

#### Immersion Freezing

#### International Conclave

● Refrigerators, cookers and washing machines are now selling in Britain as fast as manufacturers can produce them. One manufacturer told *The Times* that there could be no doubt that this year would break all records in the refrigerator business; and the trade is in general agreement that the cut in purchase tax is the principal cause of increased sales. On the most popular models the tax cut means a difference of £10 15s. in the retail price. Trade opinion is that many families had been holding back for some time in the hopes of just such a price-cut, and several manufacturers suggest that they are now selling refrigerators to people who have just finished paying for a television set. Apparently shiny kitchen equipment now ranks next to television in "keeping up with the Joneses."

● At the same time, manufacturers point out that refrigerators are both healthy and convenient, and they claim that their efforts to convince the public of the fact are now bearing fruit.

● Dealing with the effect of the present H.P. controls on the sale of domestic appliances, *The Financial Times* declares that while any overall change in these regulations would certainly affect the level of demand for the various products concerned, it is difficult to estimate what the total result would be. For although the restrictions of 1956 reduced the outstanding H.P. debt by around 20 per cent. (from some £500,000,000 to roughly £400,000,000), a corresponding loosening of the controls would have proportionately less effect to-day. Times have changed, and in particular unemployment and the decline in the amount of overtime worked in U.K. industry have cut down the spending power of many potential hire purchasers. But the sale of household appliances, and above all of refrigerators, would probably react most dramatically to any lifting of the restrictions. As an article which is not low priced and which is only beginning to penetrate the mass market in this country (it is possessed by only 12 per cent. of U.K. households), the refrigerator is in the best possible position to take advantage of any easing of hire-purchase controls. The diagram (p. 872) shows how sensitive are the sales of this article to any alteration in the hire-purchase arrangements.

● Immersion freezing is back again. Those who remember the early efforts of Zarotschneff and Petersen will perhaps be surprised at this full turn of the wheel in 25 years but the fact remains that for poultry no other system is able to retain so effectively the whiteness of flesh of the prepared bird—hence, the revival of this method. In this issue is described a model plant using perfected techniques in this field. It was quite astonishing to witness last month the speed with which the contact cooling fluid is able to crust-freeze a large turkey. Within five minutes of immersion the outer flesh had been stabilized.

● An important conference on refrigeration will be held from September 18 to 20 at the London headquarters of the British Standards Institution. It will be the inaugural

meeting of a new technical committee of the International Organization for Standardization (I.S.O.), formed on the initiative of the refrigeration industry standards committee of the B.S.I. to prepare recommendations for the international unification of interpretation and procedure of various technical and industrial aspects of this industry.

● The British Standards Institution holds the secretariat of this international committee whose full members, in addition to the United Kingdom, are: Belgium, Canada, Czechoslovakia, France, Germany, Italy, Mexico, Netherlands, Norway, U.S.A., U.S.S.R. Observer members are: Australia, Austria, Bulgaria, Chile, Finland, Greece, Hungary, India, Ireland, Israel, Japan, New Zealand, Pakistan, Poland, Portugal, Rumania, Spain, Sweden, Switzerland, Union of South Africa, Yugoslavia. It will be the main business of the conference to agree on a programme of work, to allocate priorities and to appoint sub-committees and working groups to study the numerous documents available in the various fields of the refrigeration industry and to prepare suitable drafts for I.S.O. recommendations for submission to the main committee.

● An important factor in the work of this new I.S.O. committee is the close liaison established with the International Institute of Refrigeration (I.I.R.). The Institute, which has been in existence since 1920 as an inter-governmental organization, has been acting as an international clearing house for disseminating to its members all available information on the progress of refrigeration; co-operation between the I.S.O. technical committee and the I.I.R. has been agreed in the knowledge that I.S.O. recommendations in the field of refrigeration prepared under these conditions will acquire a truly international status.

● An important document submitted for consideration at the conference is the new international testing code for refrigeration machines recently published by the I.I.R. The B.S.I. is also submitting several of its published standards as well as advance drafts of new standards and of standards being revised.

● From 1953 to 1957, a group of distinguished refrigerationists from Belgium, Denmark, France, Germany, Great Britain, Italy, Norway, Spain, Sweden, Switzerland, U.S.A., U.S.S.R., among whom were scientists, manufacturing engineers and users of machines, made a survey, under the auspices of the International Institute of Refrigeration, of the extent to which the methods of testing of refrigerating machines could be standardized and codified. At numerous meetings, the most conflicting ideas were compared, and the discrepancies between standpoints in this field were made clear. Finally, it was agreed that standardization could best be carried out in two stages: on international stage dealing with general definitions and methods of conducting tests and intended for the use of refrigeration specialists; and a complementary national stage in which a code of practice intended for users could be drawn up on the basis of the document resulting from the first stage.

● With the above in mind, so far as the first stage is concerned, a document entitled "Recommendations for an international testing code for refrigerating machines," was drawn up and published at the beginning of the year by the International Institute of Refrigeration. It includes definitions—specification to be checked in any test—the organization of tests—the different methods for the measurement of refrigerating effect—the use of measuring instruments—margins. This purely technical document, which makes no attempt to lay down the law as regards the interpretation of contracts, will be of considerable use to constructors and users. In English and in French, it is available at the



International Institute of Refrigeration, 177, Boulevard Malesherbes, Paris, 17eme. (Its price is F.F. 250.)

● To mark their centenary this year, Shaw Savill Line has issued a most attractive, lithographed short history of the company, written by that famous author, Sir Arthur Bryant. It tells how Robert Ewart Shaw set up business on his own account at 24, Billite Street, London, after being head of the freight department of London shipbrokers, Willis, Gann & Company. He took with him Walter Savill, a man of tremendous energy and organizing ability. Both were convinced that New Zealand had a future and that that future would depend on the establishment of a regular shipping service. They adopted as their house flag the beautiful white, red and blue ensign of the Southern Cross which the English traders and Maori chiefs of New Zealand had chosen in 1834 to safeguard their trading ships' status at sea.

● The Shaw Savill Line's fleet now consists of 26 vessels, with four ships now building. Nineteen of the 26 have been built post-war. Details of one of the vessels now building have just been released. She is the m.v. *Ionic* and was launched on August 14 at the Birkenhead Yard of Cammell Laird & Co. (Shipbuilders & Engineers) Ltd. The launching ceremony was performed by Mrs. E. C. Donaldson, wife of Mr. W. D. Donaldson, who is a director of the company and also general manager for Australia. The *Ionic*, the 20th vessel built for the line since world war II, is the third Shaw Savill ship to bear that name. Many will remember the second *Ionic*, a famous passenger and cargo carrier—which performed sterling service as a transport in the 1914-18 war, and was sold for breaking up in 1937—after 35 years of almost unbroken service in the United Kingdom-New Zealand trade. The new *Ionic* is a single-screw motor vessel of approximately 11,000 gross tons and her general design will be similar to the twin-screw motor vessel *Carnatic*, delivered by the same builder in December, 1956. She will have a service speed of 17 knots and in her six cargo holds, four of which will be insulated, she will have capacities for over 400,000 c.ft. for refrigerated and chilled cargo and about 240,000 c.ft. for general cargo. *Ionic* should make her maiden voyage from this country towards the end of January, 1959. In addition to *Ionic* three refrigerated cargo liners of the same class are at present on order for the Shaw Savill Line, one for delivery in September, 1959, and two towards the end of 1960.

● Prepacking is the newest way of selling fresh fruit and vegetables for better profit and is usually linked with refrigerated display. All the latest machines and materials may be seen at the International Exhibition in the Royal Horticultural Society's New Hall, London, S.W.1, from October 7 to 9. There will be over 11,000 sq. ft. of exhibition stands. Sponsored by the European Productivity Agency, in conjunction with the British Ministry of Agriculture, Fisheries and Food, the International Exhibition on prepacking is being run with full-scale commercial publicity and design by the Produce Prepackaging Development Association of London.

#### Tailpiece

● *Air Conditioning and Refrigeration News*, Detroit, publishes this true story: "Friend of ours decided to buy a window-type air-conditioner for his bedroom. He walked into a store which had a handsome display of same. Nobody was in the showroom except a pretty girl seated idly behind a small desk. 'Miss,' he said, 'I'd like to buy one of these air-conditioners.' She excused herself for a moment, and disappeared through a door. Upon returning she advised: 'Would you please come back to-morrow? All our salesmen are in a meeting with a sales promoter from the factory.'"

## Xth International Congress of Refrigeration

Copenhagen, August 19—26, 1959

EVERY potential member of the Xth International Congress of Refrigeration to be held next year is free to submit papers to the commission meetings of the congress. Such papers may not be nor have been published elsewhere prior to the congress. The papers must be within the field covered by the congress and are subject to the rules of acceptance and presentation given below.

All summaries and papers are to be sent to the papers committee, c/o the secretariat of the Xth International Congress of Refrigeration, Refricongress, Postbox 57, Roskilde, Denmark. Summaries of papers submitted to the congress must be received by the secretariat not later than December 31, 1958.

The full text of the papers including illustrations must be received by the secretariat not later than February 28, 1959. The official languages of the congress are English and French. Papers in other languages cannot be accepted.

Papers must not exceed 2,000 words, and the summary of each paper must not exceed 200 words. Papers may be accompanied by illustrations, both line drawings, half-tone pictures, and tables. However, the total page area of the paper is not to exceed that which would be used if the paper consisted of 2,000 words without illustrations and tables. All illustrations must be accompanied by captions. This applies to photographs as well as to line drawings, diagrams, etc. Drawings and photographs shall be of a quality suitable for reproduction in a size not to exceed 11 by 19 centimetres (about 4½ by 7½ inches), this being the size of the printed area of one page.

Metric or British units of measurements should be used throughout papers. Authors are encouraged to give conversions to the other system in parentheses after each figure in the text, tables, or diagrams.

Three copies of the manuscripts, summaries, and tables should be submitted to the papers committee. Illustrations should also be submitted in triplicate, for instance, one original drawing and two photostat copies.

Under the title of the paper, the names and titles of the authors should appear in the form commonly used by the authors. The addresses of the authors should also be given.

The papers will be reviewed by the members of the papers committee and submitted by that committee to the president of the appropriate technical commission of the I.I.R. for decision on acceptance.

The papers committee shall have the right to delete any part of the text which may be construed as advertising or giving undue reference to any particular product, brand, trade mark, etc.

A list of the commissions and the subjects covered by them may be had from the honorary secretary, U.K., I.I.R., 131, Great Suffolk Street, London, S.E.1.

# NEWS OF THE MONTH

**Refrigeration and A-c. Exports.**—During July 1958 air-conditioning and refrigerating machinery (commercial and industrial sizes) to the value of £664,359 weighing 1,085 tons, was exported from the United Kingdom. Comparable figures for July 1957 were 1,380 tons, worth £945,947.

**Exports' Analysis.**—Of the 1,085 tons of air-conditioning and refrigerating plant worth £664,359 exported by Great Britain in July—quoted in the preceding paragraph—84 tons went to the Union of South Africa, 34 tons to India, 146 tons to Australia, 71 tons to New Zealand, 126 tons to Canada, 217 tons to "other Commonwealth countries," 55 tons to Eire, 28 tons to Sweden, 43 tons to Western Germany, 38 tons to the Netherlands, 31 tons to Belgium, 5 tons to France, 28 tons to Italy, and 179 tons to "other foreign countries."

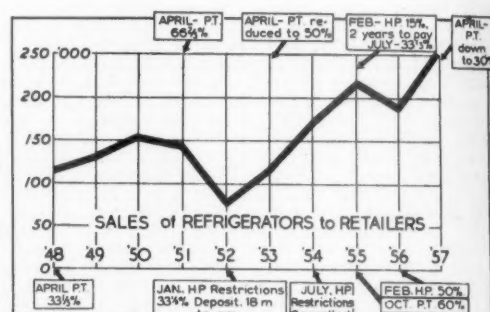
**Refrigeration Plant Classified.**—Of the total exports of air-conditioning and refrigerating machinery during July, quoted in the first paragraph, commercial refrigerators accounted for 161 tons, worth £100,679, industrial plant and equipment for 145 tons, worth £91,728, and parts for all non-automatic refrigerating machinery, for 343 tons, worth £234,366.

**Exports of Small Refrigerators.**—During July, 1,459 tons of complete refrigerators (domestic, including complete mechanical units) were sent overseas from Great Britain. These exports were worth £909,257. The 1,459 tons comprised 103 tons to the Union of South Africa, 41 tons to Rhodesia and Nyasaland, 7 tons to India, 169 tons to New Zealand, 631 tons to "other Commonwealth countries and Irish Republic," 24 tons to Sweden, 38 tons to Western Germany, 9 tons to the Netherlands, 55 tons to Belgium, 30 tons to Italy, and 352 tons to "other foreign countries."

## WOOLWORTH'S EXTEND FOOD MARTS IN SCOTLAND

Woolworth's in Scotland have opened a new store at 582, Springburn Road, Glasgow, N.I., to serve the northern part of the city. This is the firm's 12th store in the city and their 67th in Scotland. This new opening marks the continuation of a programme which has taken Woolworth's to the off-centre districts of Scottish towns where previously they concentrated on the central points. In Glasgow the firm has three central stores; higher transport charges and dispersal of population have made the district shopping centres of greater importance and new branches have been

located in the external shopping centres to take local spending power as distinct from central spending power. New branches have been opened in Dumbarton Road, St. George's Cross and in Byres Road. Other branches are currently planned for Glasgow while extensions to the chain are being developed in other Scottish centres with Kirkwall in Orkney as the most northern store yet projected. More attention is now being given to open access shopping by using wall fixtures, food trading is also featured as in more recent openings and special attention is given at Springburn Road to frozen food selling.



"Financial Times" graph showing the effect of h.p. restrictions on sales of refrigerators (see page 670 also).

**New H. & V. Research Director.**—We learn that Mr. N. S. Billington, M.Sc., M.I.H.V.E., is relinquishing his position as principal of the National College for Heating, Ventilating, Refrigerating and Fan Engineering in order to take up the post of director of research of the Heating and Ventilating Research Association at Leatherhead. Dr. R. D. Scott, M.Sc., of the Royal College of Science and Technology, Glasgow, has been appointed to succeed Mr. Billington at the National College. Dr. Scott will take up his new post in January.

**Yugoslavia, New Member of I.I.R.**—The Government of the Federative Popular Republic of Yugoslavia has acceded to the international agreement governing the International Institute of Refrigeration. In application of article III of this agreement, Yugoslavia has been admitted as a member country of the International Institute of Refrigeration.

**German Convention.**—The German Refrigeration Association (D.K.V.) are holding their annual conference this year in Cologne from September 17 to 20. The conference opens with an opera or an informal gathering in Guerzenich. The official opening on the 18th will be by State Secretary Professor Dr. Brandt, whose address will be on "German research—a basis of our future." Papers and subjects for discussion will include: Application of analytical methods in refrigeration technology; air-conditioning knowledge with reference to selection of refrigerating machines; room air-conditioners and central plants for office

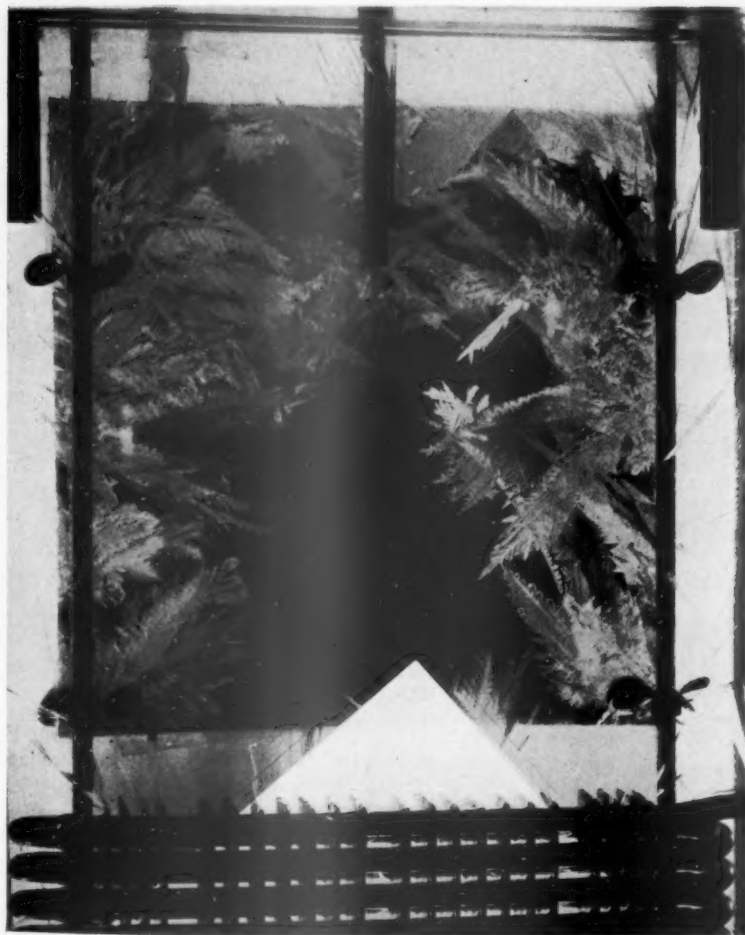
buildings in the light of refrigeration; vapour diffusion through walls; heat transfer and pressure loss in annular sections; developments in freezing out of aqueous solutions; some considerations of the lay-out of motors for motor compressors; developments in construction of hermetically-sealed motor compressors; expansion turbine in low-temperature technique. Social events include a steamer trip on the Rhine, trips to the Eifel, Ahr-Rheintal, and Bad Godesberg. There are also visits to various factories, including Linde's factory at Suerth.

## PICTURE OF THE MONTH



The Division of Engineering and Applied Physics at Harvard University in the United States has recently developed an entirely new type "icebox" that makes giant snowflake crystals. In fact, in five minutes it produces enormous crystals 2 to 4 in. across from super-cooled water. It allows the spectator to watch the process as the huge crystals form. It also provides a new tool

for research which may improve the quality of metals for many uses. The machine stems from an extensive study of solidification; this is part of the research programme of the division. Those working on the topic include Professor Bruce Chalmers, Assistant Professor Richard Davis, Dr. Charles Elbaum and Dr. Kenneth Jackson. In the usual freezing process, water is cooled to the freezing point, and the water remains at 32°F. while it is freezing. The scientific "icebox" supercools water several degrees below the freezing point. Freezing does not begin until the tank is "seeded" by a tube which is cooled to a very low temperature at the appropriate time. At this point crystals begin to form in the water, looking like "amphibious snowflakes." They grow very rapidly into long tree-like structures called "dendritic crystals." The crystals are viewed by polarized light which shines through the tank from the back; a second layer of polarizing material between the crystals and the observer causes the growing ice crystals to appear coloured. The colours produced run through the whole spectrum, shading into one another like the colours of an oil slick.





The Hallmark immersion freezer for the very rapid crust freezing of birds maintains their natural whiteness of flesh.

### WITH THE AID OF REFRIGERATION

## The Frozen Turkey is now a Year-round, Price-stabilized Product

THE fact that the oven-ready trade in poultry has come to stay has meant that refrigeration has become essential to the poultry packer and nowhere is this truer than in the turkey business.

Great benefits are accruing to the public as a result of the happy liaison between refrigeration maker and poultry farmer. The housewife can now purchase, in most shopping centres in the country, a "standardized" bird of high quality at a *fixed price* throughout the year. In short, she knows what she is getting, and what she will have to pay

for the product at any given time ; moreover, her preparation worries are at an end.

How this revolution in poultry marketing has been brought about was well illustrated during a visit last month to one of the leading packing stations in the country, namely, Hoppers Farm, Great Kingshill, Bucks, the owner of which is Mr. John S. Lintern.

The visit was made by our representative to see the latest example of immersion freezing, a process which imparts a wonderfully white finish to the flesh of the bird.



As an introduction to the process which is described later, it should be stated that Hoppers Farm is the largest turkey-growing farm in the British Isles, and the present intake capacity is approximately 70,000 day-old poults per year, all of which are specially produced by the three leading breeders of the country. It is undoubtedly the best laid-out and most modern turkey farm in Europe.

In the words of Mr. Lintern: "We rear 60,000 to 70,000 turkeys per year here, and every bird is made oven-ready in our own packing station. That is to say, each bird is plucked clean of all feathers and stubs, eviscerated, and then cooled. Rapid cooling in water chilled by flake ice helps to minimize the bacteria count. Following cooling, each bird is vacuum packed in a transparent 'Cryovac' bag which is shrunk on to the carcass by heat, and it is at this stage that efficient refrigeration becomes vital if the bird is to retain its natural flavour and reach the customer in perfect condition, perhaps months after it has been processed.

"In this packing process each bird is packed in an individual cardboard carton, and is well lagged with wood wool. This enables us to deal with small orders, even down to single birds, and the purpose of the wood wool is to insulate the bird and hold it in rock-hard condition whilst in transit." In fact, without any additional refrigeration the bird will reach any part of the British Isles still frozen.

In the packing station, the birds are immediately killed and mechanically plucked, completely free of all feathers and stubs. As the birds leave the

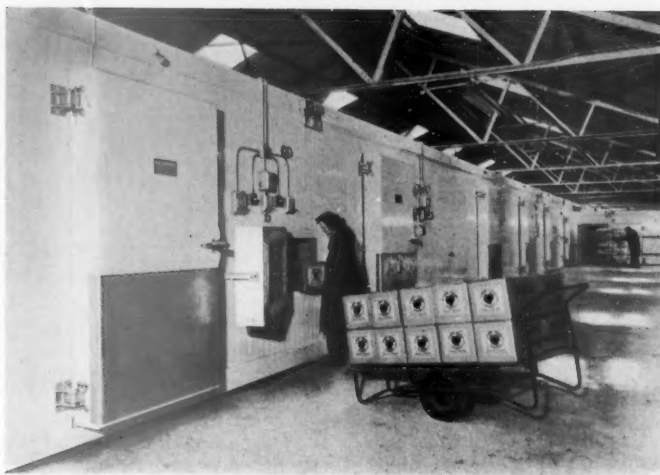
plucking machine, they are attached by their legs to shackles, which themselves are attached to an endless track which moves at the rate of 6 ft. per minute. This track runs over stainless steel troughing, and as the birds progress, they are completely eviscerated by a team of women. At the end of the line, the carcass is thoroughly washed, inspected, removed from the line, the sinews in the legs drawn, and the carcass is then placed in cooling tanks filled with water and flake ice.

The following day the carcass is removed from these tanks, drained, inspected again, and the giblets (*i.e.* the heart, liver and gizzard, which have been thoroughly prepared) are placed in a transparent polythene bag, and placed in the neck cavity of the carcass. The neck itself is placed in the body cavity and the carcass is placed in a heat shrinkable "Cryovac" bag, from which the air is then pumped and the end of the bag sealed with a metal clip, thus giving the carcass complete protection against all forms of contamination. As soon as the bag is sealed, the wrapped carcass is momentarily dipped in very hot water, which causes the "Cryovac" bag to shrink to the contours of the bird.

As soon as possible after having been vacuum packed, the birds are either blast frozen or immersion frozen to a temperature of well below zero, and are then graded and packed, complete with handling instructions, in individual cartons. In addition to the flake ice machine, the immersion freezer, the blast freezer, there is sub-zero storage in the packing station for 15,000 cartons.

This "Hallmark" blast freezer handles 192 turkeys every three or four hours.





On the left are holding rooms for turkeys; a total of almost 14,000 c.ft. is available and is maintained at temperatures between 0°F. and -10°F.

The whole of the refrigeration plant has been installed on this farm by J. & E. Hall Ltd.

The first refrigeration plant to be fitted, approximately three years ago, was a 2,000-c.ft. cold chamber, designed to maintain a temperature of about 0°F. for freezing and storing oven-ready turkeys. The chamber was constructed on the sectional principle so that it could be dismantled and re-erected at another position in the future if desired. The inside dimensions of the chamber were 14 ft. wide by 19 ft. deep by 7 ft. 6 in. high and it was insulated throughout with 8-in. compressed cork slab suitably vapour sealed on the outside of the cork to arrest the migration of water vapour. The walls and ceiling were lined with Eternite granite sheeting which has a hard polished surface, is easily cleaned and requires no subsequent maintenance.

The refrigeration plant installed for this first chamber was a 5-b.h.p. Hallmark machine with a remote type, air-cooled condenser and a forced draught, ceiling-mounted cooler was fitted inside the chamber complete with two 18-in. fans. The refrigerating machine and the air-cooled condenser was installed outside the main building in a weather-proof louvred housing. Two thermostats were supplied so that if the chamber was not required for freezing and storage of frozen birds, it could be operated at a temperature just above freezing point for chilling turkeys. One heavily insulated door of the super-freezer type was fitted and the door frame incorporated an electrically operated heater which prevented any possibility of icing.

In June 1956 increased sub-zero storage accommodation was required and a 4,000-c.ft. sectional chamber was erected alongside the existing chamber

and was built to a similar specification, but with two super-freezer doors.

Two 4-h.p. Hallmark machines were installed to operate on this chamber each with remote type, air-cooled condensers and each working in conjunction with a forced draught cooler in the chamber. As before, the machines and condensers were installed outside the building under a louvred weatherproof housing.

The chamber was designed to maintain a temperature of -10°F. for the storage of frozen turkeys and measured 28 ft. wide by 19 ft. deep by 7 ft. 6 in. high.

In August 1956 still further storage capacity was required, and an additional 4,000-c.ft. chamber, similar to that previously supplied, was installed and on completion of this plant Mr. Lintern had a total storage capacity of 10,000 c.ft. All the chambers were constructed on the sectional principle and were insulated with 8-in. cork slab throughout.

#### Blast Freezer and Holding Room

Early this year it was decided to install a blast freezer in order to accelerate greatly the freezing rate of the oven-ready turkeys. At the same time still further low-temperature storage accommodation was required and another sectional cold chamber of approximately 4,000 c.ft. was provided to facilitate handling of the frozen turkeys.

It was decided that they should be frozen on trucks and therefore the site was excavated for the area of the new blast freezer and holding room so that when the cork floor and covering of these two rooms was laid, the floor would be flush with the outside area. To avoid the possibility of

freezing the sub-soil and consequent damage to the floor by frost-heave, electric heating cables were installed below the floor insulation to maintain automatically the temperature just above 32° F. under the floor insulation.

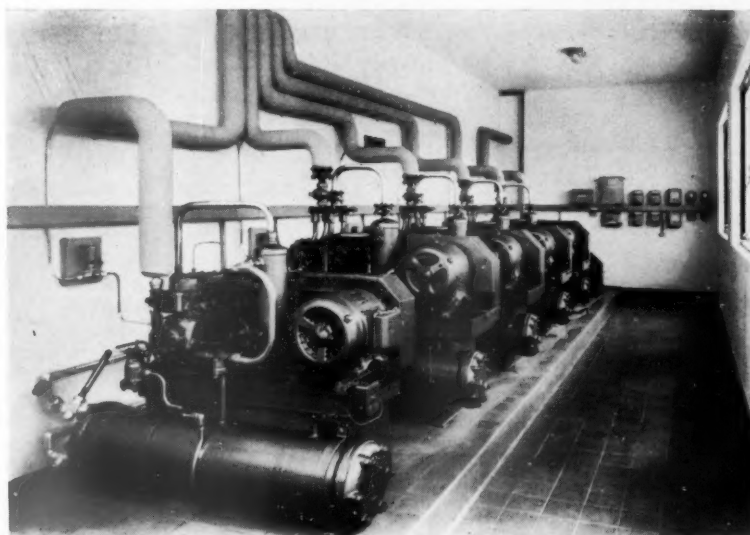
The blast freezer measures inside 15 ft. 6 in. wide by 11 ft. 6 in. deep by 7 ft. 3 in. high and provides accommodation for six special turkey trucks in two rows of three. The trucks are designed to hold 32 large turkeys on four shelves so that 192 can be in the freezer at one time.

Four 7½-h.p. Hallmark refrigerating machines were supplied to work on this blast freezer, the machines having water-cooled condensers supplied with water from an induced draught water-cooling tower, which allows the water to be continuously

freezer is designed to maintain a temperature of -5° F. and a 7½-h.p. Hallmark machine with a remote air-cooled condenser operates on this room. Two ceiling-mounted coolers are fitted in the room each having two 18-in. fans and these coolers incorporate automatic electric defrost equipment.

The five coolers in the three chambers first installed, and also the large multi-circuit cooler in the blast freezer are defrosted by water pumped from four 500-gal. storage tanks fitted for the purpose, and it is possible to defrost the five coolers in the chambers at one operation and clear them of frost in a period of approximately 20 minutes. The water is returned to the tanks and used over and over again.

Interior of one of the refrigerating plant rooms showing "Hallmark" machines.



recirculated. These machines operate in conjunction with a large multi-circuit extended surface cooler. The cooler is situated at one end of the freezer and air is circulated at high velocity over the turkeys by two 4-h.p. 13-in.-diameter fans, arranged so that the air flow can be automatically reversed at predetermined periods.

The blast freezer was designed to freeze 192 11-lb. turkeys in about four hours.

Special air guides and baffles were incorporated to ensure the maximum air velocity over the birds and the trucks are guided in position by hard-wood rails extending for the depth of the freezer.

Two super-freezer doors are fitted, the frames incorporating electric heaters to prevent icing, and a third door gives access to the fan compartment.

The new holding room which adjoins the blast

#### Immersion Freezing Plant

Of considerable interest to the poultry trade is the Hallmark immersion freezing plant recently set to work at Hoppers Farm. This can be described as a tank freezer.

J. & E. Hall Ltd. carried out a considerable amount of research and experimental work before finalizing the design and are able to install immersion freezing plants of any size.

The immersion freezing plant is designed to freeze rapidly suitable, wrapped products by direct contact with low-temperature brine. With this method it is only necessary to partially freeze turkeys to obtain a good colour. Contact with the liquid freezing solution very rapidly freezes the surface of the birds and this maintains the natural

white colour of the flesh desired by caterers and the housewife.

After removal from the tank the brine is rinsed off by water. The turkeys are then transferred to the blast freezer or low-temperature stores to complete the freezing process.

The plant consists essentially of a welded steel tank, suitably insulated, and containing a cooling coil coupled to a 4-b.h.p. Hallmark machine with water-cooled condenser supplied with water from the main cooling tower. The birds are loaded into the tank at one end and floated down its length, breast downwards, under the action of a 2-h.p. pump circulating the freezing liquid. The backs of the birds, which rise above the liquid level, are sprayed with the low-temperature brine.



Col-Flake ice-maker supplying 1 ton of ice per day for chilling turkeys.

In 15 minutes with brine at  $0^{\circ}\text{F}$ . turkeys in shrunk and sealed "Cryovac" bags can be frozen hard on the surface to a depth of  $\frac{1}{4}$  in.; in 30 minutes to a depth of just over  $\frac{1}{2}$  in. and in 100 minutes can be frozen right through the breast to the bone.

#### Plant Room

The cooling tower, which supplies water to the water-cooled condenser, is situated at one end of the new plant room, which has been constructed at the front of the main building and is suitably

ventilated. This section also houses the air-cooled condenser of the new holding room.

The plant room contains six Hallmark refrigerating machines, four for the blast freezer, the machine for the immersion freezer and the machine for the new 4,000-c.ft. holding room, also the water pump for the water-cooling tower and the necessary electrical control gear.

For the rapid chilling of birds after evisceration a Hallmark Col-Flake ice-making machine has been installed; this consists of a vertical freezing drum, over the inner surface of which a film of water is allowed to flow and after freezing scraper blades remove the ice. The unit incorporates a water pump and a motor which drives the scraper knives and the plant will supply ice continuously at the rate of 90 to 100 lb. per hour. The ice-maker is mounted at a high level above a circular insulated ice-receiving bin which is carried from the floor on tubular supports. A mobile tank or other receptacle can be run under the receiving bin and ice is drawn as required through an aperture in the bottom which is fitted with a sliding shutter.

The ice produced by this equipment is particularly suitable for chilling poultry by adding it to the clear water tanks in which the birds are normally plunged after they have been eviscerated, thus quickly reducing the temperature to a safe level ensuring the maximum hygiene and minimum bacteria count. The ice comes from the machine in flakes about the size of coins and is ready for immediate use. The thickness is about  $\frac{1}{8}$  in. depending on operating conditions.

The Hallmark Col-Flake ice-making plants are made in sizes from  $\frac{1}{4}$  ton per day to 12 tons per day.

The ice maker is operated by a 5-h.p. Hallmark refrigerating machine with a remote type air-cooled condenser. The refrigerating machine is located alongside the storage bin and the remote condenser is installed outside the building in a louvered weatherproof housing.

#### NEW PUBLICATION

Table of Natural Logarithms for Arguments Between Five and Ten to Sixteen Decimal Places. National Bureau of Standards, applied mathematics series 53. \$4.00. Supersedes mathematical table 12. Superintendent of Documents, U.S. Government Printing Office, Washington 25.

Logarithms are one of the most common mathematical functions. The practical computer in mathematics, physics, and engineering should find this table very labour saving in view of the fine interval, since four-figure arguments are sufficient in practice; whenever the logarithm of a number given to more than four places is needed, linear interpolation is usually satisfactory since it gives approximately nine decimal place accuracy over the range of the table. Besides the practical use of the tables by engineers and other computers who have frequent use of natural logarithms and wish to obtain them with the least amount of effort and time, they are applicable and of great value in the preparation of many mathematical tables of other functions.





Mr. Peter Bennett, who is a director of Associated Fisheries Ltd. and a son of Mr. W. A. Bennett, chairman and managing director, points out a feature of a model of the new processing plant which is to be built for Associated Fisheries at Orwell Street, Grimsby. The new plant is expected to cater for the major part of the fish processing requirements of Eskimo Foods Ltd., a wholly-owned subsidiary of Associated Fisheries Ltd.

## Fishing Ports' Storage Facilities to be Increased

**T**HREE major building schemes to be undertaken by one of Britain's leading frozen food processors will add considerable cold storage capacity to the ports of Grimsby and Hull.

Firstly, a new processing plant, which when complete will be the most up-to-date in the country, is to be built for the processors in question, Associated Fisheries Limited, on a site in Orwell Street, Grimsby.

The new plant is expected to cater for a major part of the fish processing requirements of Eskimo Foods Limited, a wholly-owned subsidiary of Associated Fisheries Limited and one of the leaders of the rapidly developing quick-frozen food industry.

The Grimsby factory on the south bank of the Humber is one of three expansion schemes which will together greatly increase the cold storage and processing capacity available to Eskimo Foods Limited and provide for future expansion. The other two projects are a new cold store at Walcott Street, Hull, which will soon be ready for operation, and a cold store at Pelham Road, Cleethorpes, which will be completed in about a year.

Close proximity of the new processing plant and cold stores to the fish markets of Hull and Grimsby—which are within hailing distance—will ensure a continuation of the Eskimo policy of processing only sea-fresh fish of the very best quality. Eskimo are, of course, controlled by Associated Fisheries whose fleet, comprising 63 trawlers, is the largest in the world.

The new plant at Orwell Street, Grimsby, is expected to take about twelve months to build. The site is already "piled" and building will start soon. Full capacity, when complete, will be about half a million pounds of fish per day—or enough for 944,000 fish meals per day. Freezing equipment and cold storage facilities will be the most up-to-date available. Cold storage will be at minus 20 degrees fahrenheit, which is equivalent to 52 degrees of frost. Fully-mechanised handling, including fork-lift trucks, will ensure speed and economy and, as in all Eskimo plants, great emphasis will be placed on hygiene.

It is anticipated that the factory will employ 300-400 workers. The building is designed to provide comfortable working conditions and there

will be a full system of heating and ventilation. Welfare facilities include staff canteens.

The factory will cover a site 360 ft. long by 90 ft. wide. The 90 ft. width has been divided into a 70 ft. wide single storey production area, for the whole length, with a completely unobstructed floor. The remaining strip 20 ft. wide by 360 ft. long, will be a two-storey structure of about the same total height as the single-storey section and will contain offices, cloakrooms, carton stores, canteen and engine room. There will be a gallery along the full length at first floor level overlooking the whole production area.

The building was designed by Jenkins, Manning, Potter and Clamp, consulting engineers and architects of 66, Victoria Street, London, S.W.1, and contains many features which are a great advance on comparable buildings in the industry.

The roof is entirely constructed of finely finished preformed concrete sections, supported by 70 ft. span concrete trusses formed from 10 ft. sections stressed together by high tensile steel cables, which are protected from corrosion by the concrete. The shape of the roof is scientifically designed to provide the highest uniform level of daylighting without glare and is fully insulated to afford uniform working conditions throughout the year.

All concrete surfaces are chemically treated to reduce staining by water absorption and all wall and floor finishes have been selected to provide durable, maintenance free and hygienic surfaces. A carefully planned system of service mains has been incorporated in the roof construction so that electricity, water supplies, etc., can be dropped to any point in the production area.

The lay-out is so planned that six ten-ton lorries can be off-loaded at one time and the same number loaded concurrently at the despatch end.

Plans for the new cold store at Pelham Road, Cleethorpes, are now complete and provide for the most up-to-date methods of construction, insu-

lation and refrigeration combined with the latest equipment to assist in efficient store management.

Levelling and excavation of the site, formerly an orchard, is now well advanced and the cold store controlled automatically to operate at a temperature of minus 20 degrees fahrenheit, will have a capacity of approximately 762,000 cubic feet. The building will cover an area in excess of that required for a full-size football pitch and is expected to be in operation by May 1st, next year. Pelham Road will then serve as the main despatch point for the various Eskimo fish, fruit, vegetable, meat and poultry processing plants in the area.

Handling of goods into, and out of, the new store will be by pallet-transporters and fork-reach trucks. The accent throughout will be on ease and speed of movement.

The structure will have two large chambers, each 103 ft. wide by 185 ft. long and with a height of 20 ft. There will be no internal stanchions to impede movement. Between these two large stores will be a smaller chamber which will be common to both and through which all goods will be routed before despatch. With the exception of the administrative and welfare block, the whole of the area will be at ground level. A number of new features which will be included in the plant and fixtures will make this one of the finest cold stores in the world.

The new building at Walcott Street, Hull, to be opened shortly, is designed as a two-storey cold store. Each of the two chambers is insulated on the envelope principle with an uninsulated, independent concrete floor structure within the insulating envelope. The lower floor is designed for fork-lift stacking and the upper floor for manual stacking.

The front section of the building contains offices and engine room. There is space for installing plate freezer plant and packing machines.

"Jackstone" froster double-contact plate, quick-freezing machines have contributed much to the post-war progress of the quick-freezing of fish, fruits, vegetables, meat and precooked foods in the U.K. and throughout the world. Machines have been exported to many countries including the following: Australia, Belgium, British West Indies, Czechoslovakia, Holland, India, Newfoundland, New Zealand, Norway, Poland, Portugal, South Africa, Spain, Sweden, Tasmania and Uruguay. The "Jackstone" was originally designed by the late Mr. Jackson Stone, the well-known

American engineer, prominent for many years in the development of quick-freezing in the U.S.A. In 1946, Jackstone Froster Ltd. was formed to acquire the patent rights and to manufacture and market the "Jackstone," which is still the only mobile, self-contained plate freezer manufactured in the U.K. The "Jackstone" range now includes plate freezers containing up to 20 stations with detached refrigerating units. Production of the "Jackstone" commenced in England in 1947 and so great was the demand that by March 1948 almost 100 had been manufactured and installed; by

March 1949, this number had been more than doubled. As a result of very considerable experimental work Jackstone Froster Ltd. have extended their range of plate freezers and, in addition to the self-contained, "Freon"-operated "Jackstone" junior mark II (7-station), "Jackstone" senior (7-station), "Jackstone" model "A" (15-station), they are now able to offer "Jackstone" model "A" double contact multiplate quick-freezing cabinets containing from 7 to 20 stations suitable for "Freon," ammonia or brine operation for installation on land and in ships.

# Refrigeration Controls—9

## PRESSURE-OPERATED TYPES

By H. H. EGGINTON

(Continued from August issue)

### ELECTROMAGNETIC OR SOLENOID VALVES

THESE valves are essentially stop valves electrically actuated which give fully closed or fully open conditions, *i.e.* they do not modulate. They are used to control the flow of liquid and vapour refrigerants and are commonly used for water and brine flow control.

The capacity of such valves is purely a matter of the orifice size, discharge coefficient of the orifice and the pressure drop for a given medium, at given temperature and pressure conditions. Different valves can therefore be reliably compared on orifice size. Most manufacturers provide data for capacity in terms of pressure drop for given conditions and the fluid being controlled. Considerable variation exists with different manufacturers on the relation of connexion and valve seat dimensions and operating pressure standards; these points must be carefully checked when comparing different valves. Since the power of the prime mover, *i.e.* the coil, is limited by physical dimensions, it will be found that maximum operating pressures are in relationship to the seat area and that these pressures fall rapidly with increased seat diameter. This has led to the development of valves with small pilot seats and built-in servo mechanisms to achieve high-pressure performance from standard electrical coils. The maximum operating pressure is, of course, the difference between upstream and downstream pressure, which some manufacturers refer to as maximum operating pressure differential—that is, the pressure drop across the closed valve.

#### Principal Requirements

(1) The valve construction must be robust and moving parts adequate for pressures operating on the valve. For general use on modern refrigerants protection for 300 p.s.i. is essential and this is desirable as an operating pressure.

(2) Dimensional clearances must be adequate particularly around the armature to avoid sluggish action in the presence of liquid, *i.e.* no dashpot action, otherwise the valve may fail to open.

(3) The valve must have good shut-off characteristics and positive open/close action, the valve going immediately to full flow and shut condition on being energized and de-energized. This latter point is very important on servo type valves, where the closing action must be positive in spite of the fluid flow conditions: this is a problem of port areas and thrust loads in the design.

(4) The valve must be quiet in operation and parts must not oscillate in harmony with alternating current.

(5) The electrical coil must be rated for continuous duty and not show more than 80° C. rise in temperature, measured by change in resistance of windings from ambient temperature. It must show adequate electrical insulation and moisture resistance.

(6) There must be no residual magnetism effects in the electro-magnetic circuit, this being primarily a matter of type of materials and temper condition.

(7) If soft seat materials are used they must be highly resistant to the refrigerants and oils and also be capable of withstanding heavy static loads and repeated impact without deterioration.

#### Construction

Materials commonly used in valves suitable for common refrigerants, excluding ammonia, are stamped brass bodies with brass and monel armature tubes, stainless iron armatures and armature stops, with annealed mild steel solenoid pots, circuit plates or washers. Seat materials are, when metal to metal, monel or stainless steel, although the use of synthetic seating materials such as rubber, nylon or fluon (polytetrafluoroethylene) is becoming more popular, the latter material particularly, in view of its ability to work at high and low temperatures, and complete inertness to refrigerants.

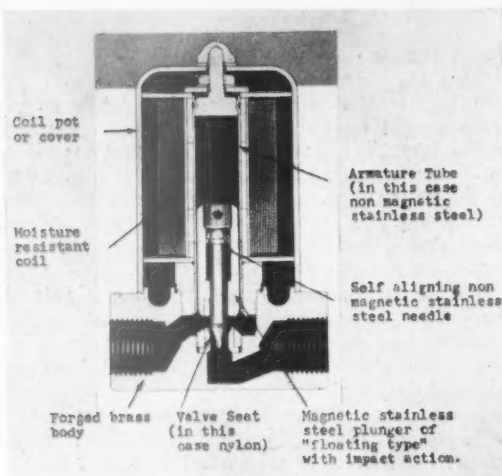
The servo type valves use diaphragms or pistons to operate the larger seat and in the case of the former, rubber or plastics are generally used. Where piston servo mechanisms are concerned the

piston is commonly of brass sliding in a brass cylinder which forms part of the body of the valve.

Where valves are designed for ammonia, the brass materials are substituted by iron, steel, stainless steel and monel.

Connexion arrangements vary considerably and include sweat, weld flanges, flare, plain and taper thread.

Electrical coils are wound from insulated copper



By courtesy Penn Controls Inc., U.S.A.

Fig. 25.—Typical solenoid valve.

wire and the wound coil is usually vacuum varnish impregnated to give complete electrical insulation and moisture resistance. A variety of coils must be available for standard electrical voltages.

#### Operating Characteristics

Fig. 25 is typical of the direct acting solenoid valve and the principles of operation can be described from this sectional view. The solenoid coil, when electrically energized, produces a magnetic field which attracts the armature up into the coil, when the electrical current is switched off the armature falls. It will be seen from the picture that the needle is not rigidly fixed to the armature, but so arranged that the armature can accelerate some distance into the coil zone before lifting the needle. By this arrangement an impact is imparted to the needle and the lifting force applied to the needle is considerably greater than a direct pull from the armature. This means that the pressure against which the valve can open is greatly increased. In this particular valve the armature actually comes to settle a little distance from the stop when the coil is energized, and is therefore "floating." Other types of valves use the principle

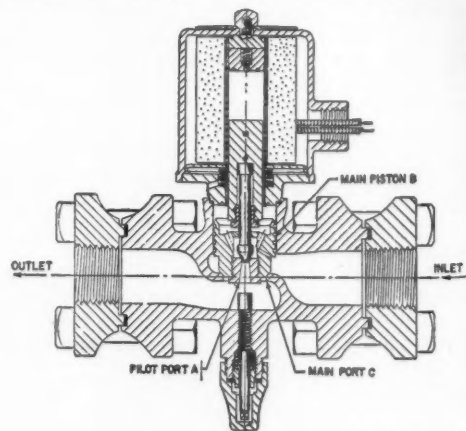
that the armature actually contacts the stop, and in such cases kick-off springs are sometimes necessary to avoid any danger of the plunger being held up by residual magnetism in the iron circuit when the current is switched off, this being a serious form of failure—the valve not closing.

All solenoid valves close with the direction of flow, that is the fluid flows over the needle and then through the orifice, therefore the pressure across the valve holds the valve shut. Reversing the flow is rarely practicable, since even low pressures are capable of lifting the weight of the needle and armature.

Fig. 26 shows a typical piston servo valve, the method of actuation of the pilot seat being identical with that described for a direct action valve. However, when the pilot port A is opened by lifting of the needle, the pressure of the inlet, which is fed to the top of the piston B via a bleed orifice in the side of the piston, is released by the pilot port A faster than it can be fed in by the bleed orifice. The pressure beneath the piston is therefore greater than the pressure above, and the piston lifts opening the main port C. When the armature falls and the pilot port A is closed, pressures above and below the piston B equalize, causing the piston to travel downwards and the pressure drop across the valve holds the piston and therefore the main port C in a closed position.

In this picture the kick-off spring to break the armature from the stop is set in the stop and also a shading ring usually of copper is set in the stop to suppress alternating current chatter by producing out-of-phase alternating currents. Impact action of the armature is used to open the pilot seat.

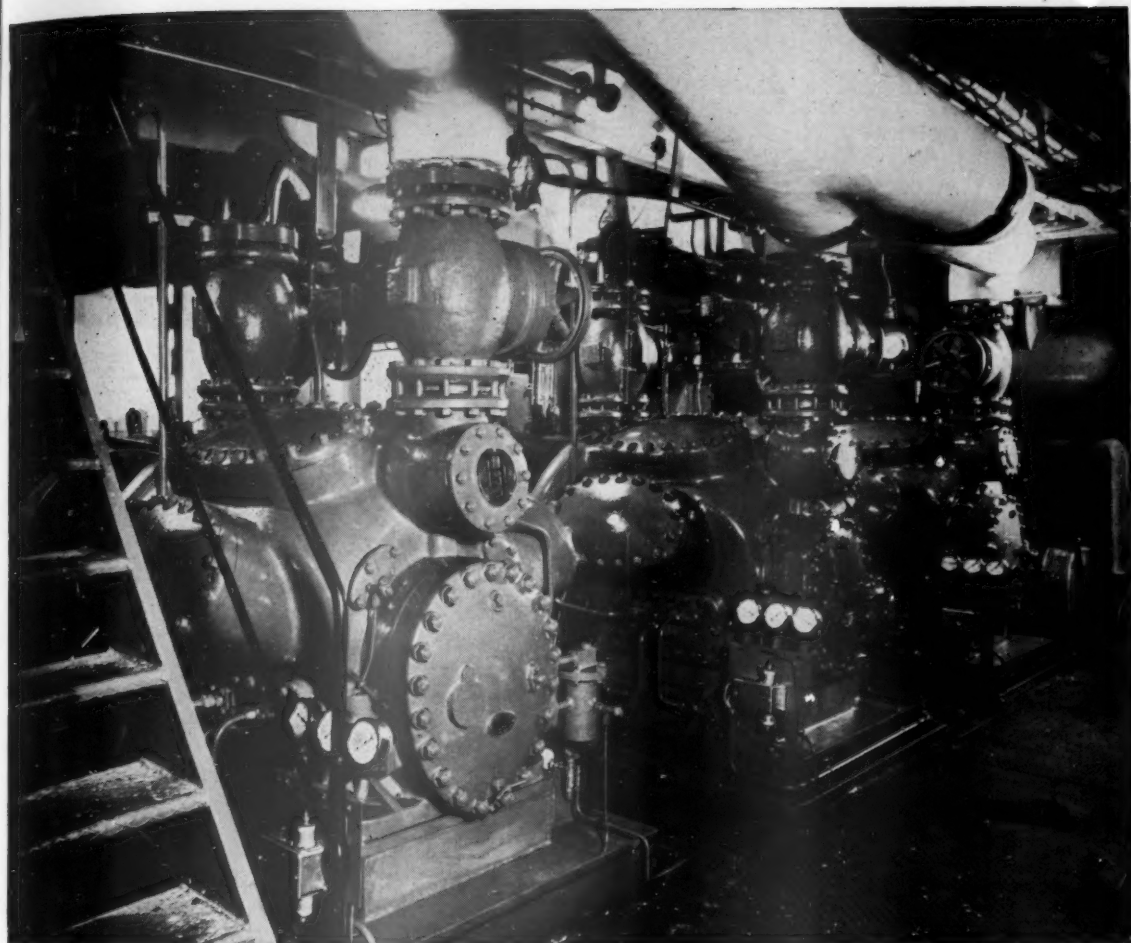
Fig. 27 is typical of the servo valve of the diaphragm type, the principles of operation being identical with the piston-type valve except that the



By courtesy Alco Valve Co., U.S.A.

Fig. 26.—Typical piston servo solenoid valve.





# Refrigeration

J. & E. Hall Ltd., with seventy-five years of experience in the design and manufacture of refrigerating compressors and accessories; offer equipment ranging from small refrigerated cabinets with compressors of  $\frac{1}{2}$  h.p. to large ammonia compressors requiring motors of several hundreds of horsepower. Today, over 65% of the refrigerated cargo space in the world's shipping is cooled by equipment of J. & E. Hall's manufacture.

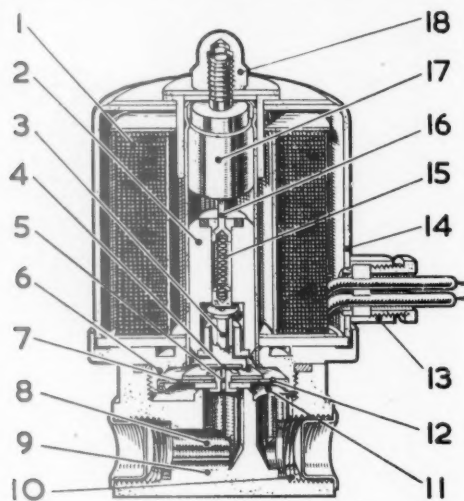


## J. & E. HALL

LIMITED

DARTFORD • KENT

diaphragm flexes to lift the main seat instead of sliding as does the piston. When the armature lifts, the pilot hole is opened and the pressure above the diaphragm escapes faster than it can be fed through the bleed hole. As a result, the inlet pressure beneath the diaphragm in the annular



By courtesy Teddington Refrigeration Controls Ltd.

Fig. 27.—Typical diaphragm servo solenoid valve.

- |                      |                         |
|----------------------|-------------------------|
| 1. Solenoid          | 10. Inlet               |
| 2. Armature          | 11. Annular recess      |
| 3. Seat carrier      | 12. Bleed hole          |
| 4. P.T.F.E. disc     | 13. Cap'e entry         |
| 5. Pilot hole        | 14. Solenoid pot        |
| 6. Diaphragm housing | 15. Return spring       |
| 7. Diaphragm         | 16. Kick-off pin        |
| 8. Outlet            | 17. Stop                |
| 9. Body              | 18. Dome nut and washer |

recess lifts the diaphragm opening the main seat. When the armature falls, the pilot hole is closed and pressure is fed through the bleed hole balancing the pressure on each side of the diaphragm which closes to the seat, and is held closed by the pressure drop across the valve and the weight of the armature and kick-off spring load. In this valve it will be seen that the kick-off spring is set in the armature and in addition to breaking the armature from the stop on de-energizing, also helps to seat the main valve. It will also be noticed that in this valve the shading ring is set in the armature, and impact action is used to open the pilot seat.

#### Application

Solenoid valves can be applied to a large number of refrigerant and liquid flow systems; in all cases, however, the following points should be observed :

(1) A solenoid valve should never be wired to the load side of an electric motor circuit unless a time delay is incorporated. By using time delay or separate wiring, the coil is not energized when the starting current of the motor is producing a drop in voltage. The valve may not open under reduced voltage conditions.

(2) Direct acting valves usually have small orifices and care should be taken to see that these do not produce a restriction, causing vaporizing of liquid or reduction of vapour flow and therefore capacity.

(3) All solenoid valves have on/off action, i.e. do not modulate. Such control can lead to hunting and therefore this type of valve may not be suitable for some critical applications.

(4) A strainer or filter should be fitted on the inlet of the valve.

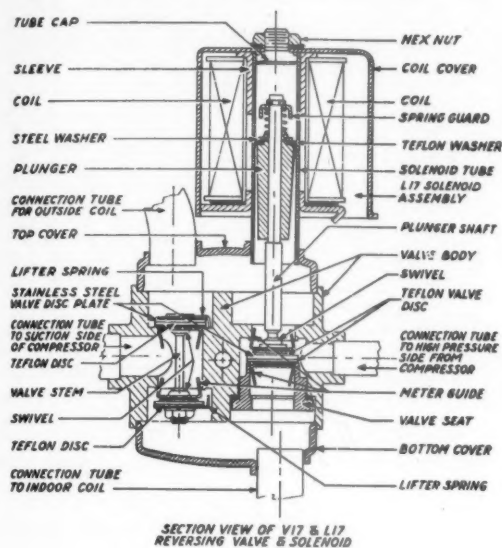
Undoubtedly, the main use of the solenoid valve is as a stop valve preceding the refrigerant metering device, such as an expansion valve, so that during the off cycle, refrigerant does not flow into the low side of the machine. In such an application they are known as king valves and electrically wired so that the valve opens when the compressor is started and closes when the compressor is stopped.

Solenoid valves installed immediately before expansion valves and operated by a thermostat, can give capacity control of a multi-valve/multi-evaporator circuit by making the thermostat switch off the solenoid valves progressively as temperature falls, i.e. switch out evaporators. Similarly, a series of rooms can be fed by a single unit and temperature controlled by each room thermostat, operating the solenoid valve attached to each evaporator. In both cases the compressor action is controlled by pressure switch. Other uses for solenoid valves are :—

For two temperature applications from a common compressor, where the valve is installed in the suction line of the warmer evaporator and is operated by a thermostat which switches the valve to a closed position when the room has achieved a low enough temperature. The colder evaporator should have a check valve installed to avoid flooding from the warmer evaporator vapour condensing in the cold evaporator.

Suction line solenoid valves are also used to close the suction line during hot gas defrosting, and as valves for controlling the hot gas discharge from the compressor. Such valves are also used to bypass compressor cylinders to effect a capacity control. This arrangement has to be carefully applied, however, to avoid overheating and may need, if prolonged, some cold refrigerant injection. In this type of capacity control the valve can be operated by thermostat or pressure switch on

reaching required conditions. A similar by-pass arrangement between discharge and suction of the compressor can be used to give an unloaded starting



SECTION VIEW OF V17 & L17  
REVERSING VALVE & SOLENOID

By courtesy of Ranco Inc., U.S.A.

Fig. 28.—Solenoid reversing valve for air-conditioning.

condition for the compressor. This system is used for very high starting suction pressure, or where the starting electrical load is excessive. It can be

made automatic by a time delay switch which closes the solenoid after the compressor has achieved running speed.

In all cases where solenoid valves are fitted to a compressor discharge, a check valve should be installed in the discharge line beyond the solenoid by-pass to avoid back-feeding of the refrigerant from the condenser.

Solenoid valves of special design can also be used to reverse the direction of refrigerant flow through evaporator and condenser of air-conditioning plants to achieve cooling or heat pump action (see fig. 28).

## TROUBLE SHOOTING

### Symptoms

Valve fails to close.

Valve fails to open.

### Remedy

First check switch or relay has opened and valve is not still "live." Dirt on seat or holding armature. Clean and fit filter. Oil sludge particularly on low-temperature work can have similar effect. Damage or distortion to body or armature tube—replace. Check electrical supply is as coil rating and there is not line drop giving voltage lower than 90 per cent. of coil rating. Check working pressures are not greater than valve rating. If coil burnt out, check supply is not more than 10 per cent. above rating (note 60-cycle A.C. coils overheat on 50-cycles, but 50-cycle coils on 60 cycles give reduced operating pressures). Dirt causing armature to stick—clean and install filter.

## The Pressure Switch

THIS instrument is probably one of the commonest refrigeration controls and as its name implies, switches electrical current depending on pressure conditions, usually controlling the compressor motor.

Two principal types of pressure switch exist—high pressure controls which break electrical circuit on rise in pressure and low pressure controls which break electrical circuit on fall of pressure. The former type is used as a control and protection device for the high side, *i.e.*, condensing side of a refrigeration plant, and the latter on the low or evaporator side. The differential, *i.e.*, difference between the pressure required to make

the switch and that required to break the switch, is different for the two applications, being a proportion of the working pressure range of the instrument. Usually low pressure instruments have a shorter working pressure range and therefore are generally more sensitive and permit a finer differential setting. In the case of low pressure controls the set point of operation on a scale corresponds to the pressure at which the switch breaks the electrical circuit, *i.e.*, cuts out, and the differential pressure is added to this value to give the pressure at which the switch makes circuit or cuts in. For example, a low pressure switch set to a scale setting of 10 p.s.i. with a differential of 5 p.s.i. will break circuit at 10 p.s.i. and make circuit at 15 p.s.i.

The high pressure controls on the other hand,

when set to a scale pressure will break circuit or cut out at this pressure and the differential has to be subtracted from this value to give the make circuit or cut in point. For example, a high pressure control set to a scale value of 180 p.s.i. with a differential of 35 p.s.i. will break circuit at 180 p.s.i. and make circuit at 145 p.s.i.

The current carrying capacity or electrical rating is usually given on the switch in terms of permissible amperage for given voltage conditions or in some cases watts or horsepower. Rating should always be quoted for both AC and DC currents.

Since many pressure switches have small electrical contact gaps, particularly on fine differential controls, it is quite usual for a condenser or magnet to be recommended for DC application. In the case of the condenser which is wired across, *i.e.*, in parallel with the contact circuit, the permissible DC rating is increased by the condenser suppressing or reducing electrical arcing. In the case of a magnet which is installed adjacent to the contacts, the magnetic field tends to quench or suppress the arc associated with the breaking of the switch. A condenser or magnet is not normally supplied fitted to a switch, and therefore this point should be watched when installing pressure controls in DC circuits. Generally, the supplier's data quotes DC rating with or without condenser or magnet, and makes it quite clear that these parts are extra fittings which are not necessary for AC duty.

#### Principal Requirements

- (1) The switch must have ease of fitting electrical cables in proportion to the rating of the switch and be amenable to fitting conduit or other wire protection systems to permit adequate electrical safety. For the same reason, suitable electrical dimensional clearances, *i.e.*, live circuit to earth, must be built into the assembly. An earth connection should also be provided, the screw or fitting not performing any other duty than electrical earthing.
- (2) The pressure connections must be of a standard type.
- (3) For general purposes the electrical rating should preferably cover 1 h.p. or equivalent watt and starting current loads, and the switch give positive action, *i.e.*, not flicker or bounce.
- (4) The assembly must be capable of withstanding a reasonable over-run of pressure conditions; for example, plus 25 per cent. of maximum scale pressure before any drift in performance takes place.
- (5) Range and differential adjustment should be easily accomplished and some form of scale available so that the extent of adjustment is obvious (note: accessibility of adjustment is not always desirable in view of unauthorised tampering).
- (6) For low pressure control a working pressure range of 20 in. Hg. vacuum to 50 p.s.i. is common with a differential adjustment of 5-40 p.s.i. although a narrow range of differential, about a mean of 10-15 p.s.i. is usually acceptable. A slightly longer range of working pressure 20 in. Hg. vacuum to 80 p.s.i. with a differential of 10-60 p.s.i. is very useful. For high pressure control a suitable range is 50-250 p.s.i. with a differential range 20-80 p.s.i. with a further switch range of 100-350 p.s.i. with a differential 30-100 p.s.i. The majority of differentials used in this application tend to be in the middle or lower end of the ranges quoted.
- (7) The case of frames supporting the prime mover transmission, ranging device and switch mechanisms should be robustly constructed and dimensionally stable under the conditions of load operative from the prime mover and ambient conditions.
- (8) All adjustment mechanisms for range and differential must be non-slip so that a stable setting can be made.

#### Construction

The use of bellows is almost universal for sensitive pressure switches, brass being used for the majority of applications, except ammonia, when stainless steel is commonly used. The case or frame taking the prime mover loads are normally metal, although at some point plastic or electrical insulating materials have to be used to mount the switch mechanism.

Screw threads are usual for range spring compression or extension because working ranges are long, and cams for such ranges are either very large or have such a rate of rise and fall that there is a danger of the setting slipping.

The electrical switch is usually of the spring snap type, although some magnet types are still used very successfully.

#### Operating Characteristics

Figure 29 shows the two main types of mechanical assembly diagrammatically represented. Considering the lost motion type, an increase in pressure in the bellows causes the range spring to be compressed and the transmission member carrying the adjustable nuts is moved upwards so that the lower nut pushes the switch arm upwards until the switch action takes place. When the pressure falls, the lower nut leaves the switch arm due to the bellows and transmission being pushed downwards by the spring. The switch arm, therefore, does not move until the upper nut is





By Appointment to Her Majesty the Queen  
Manufacturers of refrigerating machinery  
Pressed Steel Company Limited

# How we helped Dunlop make a better Golf Ball

## *The core of the problem*

At one stage in the making of golf balls the inner core has to be frozen hard. The purpose: to retain the exact proportions of the ball during the process of putting on the cover. Otherwise, the inner core would be too soft for handling and the ball might lose its perfect shape. Until 1954 the Dunlop Rubber Company used solid carbon dioxide for this purpose. They asked us at Prestcold if we could devise some more efficient and economical method.

**Intense cold, controlled cold.** The problem bristled with difficulties. True, we could produce the low temperatures easily enough; there are Prestcold appliances that go to extreme low temperature if need be. But intense cold is expensive. So to keep costs down we had to concentrate the cold in a very small area. And, of course, we had to make our plans fit the existing layout of the Dunlop factory.

**The Prestcold solution.** Our answer was to install a special blast freezer to direct a jet of very cold air at the cores. Low operating

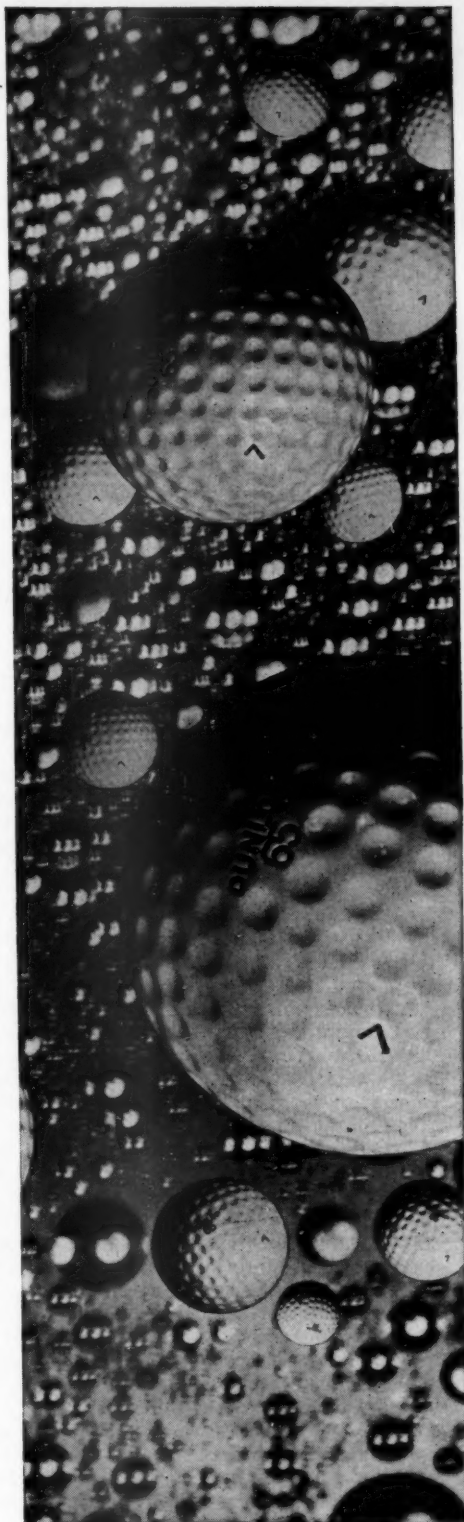
costs were achieved by our recirculating the low temperature air. Net result: a better golf ball, economically produced.

**Can Prestcold help you?** If you have a problem in refrigeration you'll probably find that existing Prestcold equipment will deal with it. Because all our equipment comes from a long line of intense research. But even if yours is an entirely unique problem please let us know about it. We shall be glad to help. Write to us or to your Prestcold distributor, or to Prestcold Commercial Sales Department, Cowley, Oxford.

FOR FRESH IDEAS...IT'S  
**Prestcold**

PRESSED STEEL COMPANY LIMITED, COWLEY, OXFORD

MODERN REFRIGERATION September 1958



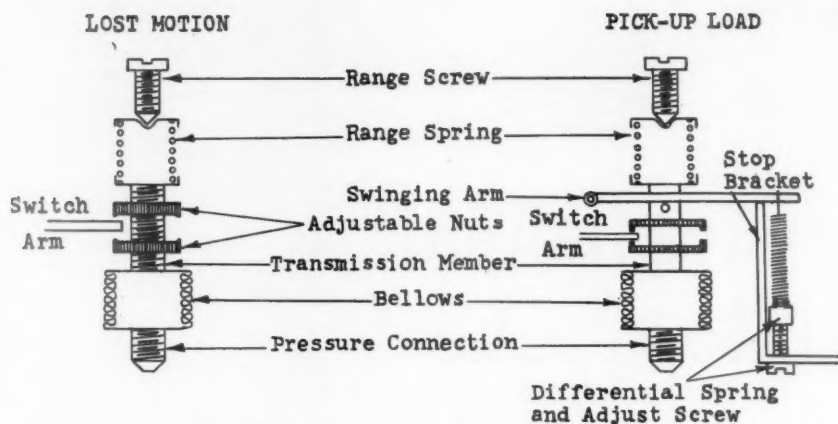


Fig. 29.—Principal differential adjustment systems.

allowed to travel downwards sufficiently, by decreasing pressure in the bellows to depress the switch arm to its original position so re-operating the switch. It will be seen, therefore, that the pressure can change appreciably before the switch is re-operated and the wider apart the range nuts are placed, the bigger the pressure change between operating and re-operating the switch. This pressure change is differential and it can be seen that the term lost motion is apt for this type of differential adjustment. If the upper range nut is adjusted, then the differential is altered by changing the falling pressure operating point, and *vice versa*, the lower range nut alters the rising pressure operating point.

In the case of the pick-up load type, increasing pressure in the bellows moves the switch arm upwards but before this can be sufficient to cause switch action, the pin in the transmission rod engages or picks up the swinging arm and in so doing allows the load from the differential spring to oppose the bellows, which has to be overcome by increased pressure before the switch arm can be moved sufficiently to operate the switch. When the pressure falls, the combined action of the range spring and differential spring causes the bellows and transmission to be moved downwards but before the switch can re-operate the swinging arm is stopped by the stop bracket, thus eliminating this load from the bellows. The pin in the transmission loses contact with the swinging arm and only the range spring operates against the bellows, but since the pressure is falling, the transmission continues to move downwards, depressing the switch arm and re-operating the switch. In this way, for a given range spring setting the switch action on falling pressure is constant, but the

differential spring can be adjusted to give greater or less load against the bellows on rising pressure, hence the differential is adjusted. This description covers the pick up load system for low pressure switch, but it will be obvious that the differential spring and swinging arm can be re-positioned to give differential adjustment on falling pressure.

Pressure switches are available with single pole/single throw, single pole/double throw, and double pole/single throw action, permitting single control, change-over action and two circuit control respectively.

The majority of electrical switch mechanisms used in pressure switches are snap action type, where the snap characteristics are achieved by a toggle action with a spring in compression extension. Some switches still successfully use the armature and magnet method of achieving a snap action.

Fig. 30 shows a typical pressure switch construction, the switch snap action in this case being a tension spring operating a toggle action. It will be noticed that this is a pick-up load differential type instrument with magnet space for increasing the DC current rating. Fig. 31 illustrates one of the most recent switch mechanisms, based on the "C" spring compression system. Claims made for this type of switch are that a high proportion of contact load is maintained until the instant of break and reduced rebound time on making circuit.

Fig. 32 is an example of a magnet type switch pressure control with differential achieved by the lost motion method.

#### Application

Pressure switches are essentially protection de-

vices to control the compressor motor against excessive high side pressures or to control evaporator pressure by cycling of the switch. The main disadvantage with this type of control is that it measures pressure which may not be faithfully representative of the temperature conditions, the latter being the ultimate object of refrigeration work. Caution is recommended in installing pressure switches in systems controlled by other instruments operating on purely pressure sensitive principles, *e.g.*, constant pressure valves, otherwise completely erratic control may result. Similarly, the extent of differential of a pressure switch may lead to a variety of hunting conditions, a wide differential giving a wide swing in controlled condition, a fine differential giving rapid cycling. These complications are so much a matter of individual plants and conditions that it is almost impossible to lay down any optimum conditions. There are, however, certain basic installation recommendations which are applicable to all pressure switches.

- (1) The installation should avoid vibration from the machines if possible.
- (2) Particularly with high side pressure control, some form of restriction in the pressure connection is desirable to avoid surge from the compressor.
- (3) Electrical rating should be checked, particularly on DC current, and condenser or magnet fitted if recommended.
- (4) The switch should not be adjusted beyond its scale ranges, otherwise it may be found that the control becomes inoperative.

A large variety of special purpose pressure switches have been evolved for particular types of refrigeration machinery. These include oil pressure protection switches which sense the

crankcase refrigerant pressure, and this pressure combined with oil pressure, switching off the motor after a pre-determined time delay. The delay is necessary so that the machine can be started in the first place, and if oil pressure is built up sufficiently quickly, kept running; also so that a temporary oil pressure failure does not lead to a stoppage.

Another common switch is one which operates on both high and low pressure—acting as an on/off control on the low pressure side and an excess pressure switch on the high side.

Pressure switches which lock out on either excessively high or low pressures and need manually resetting, also exist, being used where extreme pressure conditions represent a serious condition.

All these special controls, however, are based fundamentally on the basic forms of pressure switch described.

### Trouble Shooting

#### Symptoms

Switch fails to cut in

#### Remedy

Ascertain if manual reset control, and if not that the switch has failed to operate, *i.e.*, the leads from the switch are not "live" and the fault does not lie elsewhere.

Check differential and operating pressures against the prevailing temperature and pressure conditions. Reset as necessary.

Check electrical connections and see that contacts are clean (particularly on pilot circuits).

Check that no restriction exists in pressure line to switch, *e.g.*, stop valve shut

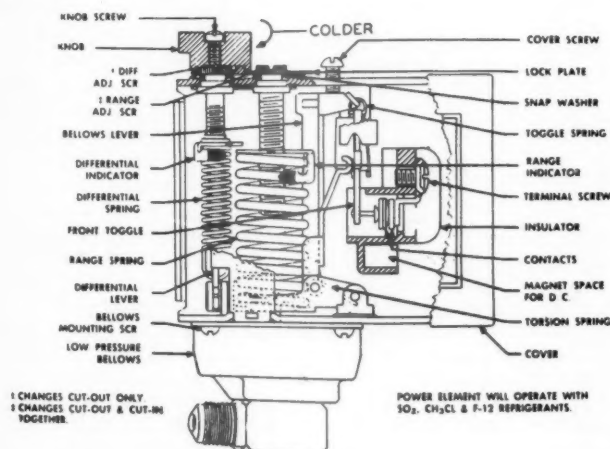


Fig. 30—Typical low pressure switch.

By courtesy Ranco Inc., U.S.A.

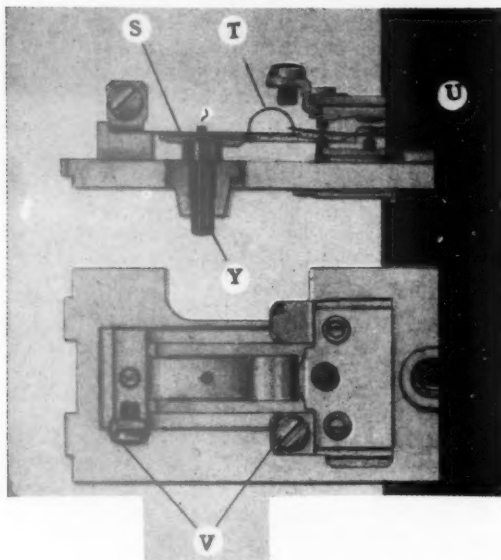
or blocked pipework or surge restriction orifice.

On a low pressure control set above ambient pressure—check if failed power element—replace.

Switch fails to cut out

Check differential and operating pressures against prevailing temperature and pressure conditions. Reset as necessary.

Check restriction as for failure to cut in.



By courtesy Danfoss Manufacturing Company

Fig. 31.—Switch mechanism with "C" spring.

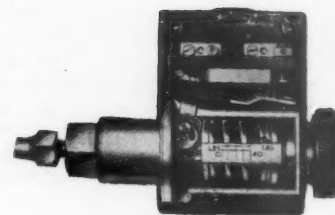
S—Contact arm  
T—Leaf spring  
U—Silver contacts  
V—Connecting terminals  
Y—Push pin

Inspect for welded contacts as result of electrical overload. On a low pressure control set below ambient pressure, check if failed power element—replace.

On high pressure switch check for failed power element or leaking connection.

Erratic Switching

Ascertain that vibration is not excessive—re-position.  
Check for leaking pipe work or failed power element.



By courtesy of Teddington Refrigeration Controls Ltd.

Fig. 32.—Pressure control with magnet type switch.

On lines subject to surge pressures, fit restrictor, or where one is fitted ascertain that it is not partially blocked. Check settings are not beyond limit of scales, or differential is set extremely fine.

(to be continued)

## More Refrigerated Shipping Space

The Oceanic Steamship Co., operator of the Matson Lines, is increasing refrigerated cargo facilities in the *Mariposa* and *Monterey*.

The new installations, costing about £60,000 for each ship, will enlarge refrigerated cargo capacity in each case from 28,000 to 42,000 c.ft. Alterations are being made to meet a growing demand from Australian and New Zealand exporting companies. The additional refrigerated space is also expected to stimulate shipments of new foodstuffs on the Australia-America route. Active competition from the new routing of the P & O and Orient Lines is thought to have been the main reason for this move.

The Australian National Line is having built a large inter-state ferry with a length of 370-ft., beam 58-ft., draft 15-ft.; it will be powered by diesel engines developing 8,600 h.p.

Vehicles carrying cargoes, and motor cars will enter the vessel through a hinged watertight door at the stern and travel on enclosed decks running all the way fore and aft. Insulated vans and containers will be available for fruit and vegetables, and this produce will be delivered to the Melbourne markets about 16 hours after leaving the Tasmanian port. The vessel also has accommodation for 334 passengers. The people of Tasmania have been advocating the provision of such a vessel for years, and next year it will become reality.



# SHOP REFRIGERATION NEWS



## New Installation for Bath Co-operative Society

**T**HE accompanying photographs were taken at the Bath Co-operative Society's recently opened food hall on the Odd Down Estate. This estate—some two miles outside Bath City—has grown considerably since the war and at the present time has a population of 5,200. It is served by 33 shops, among which, unquestionably, the new food hall is the largest and most comprehensive.

Originally, the Bath Co-operative Society had one small grocery store and one small butcher's shop on this site. The grocery has now been enlarged to its present 2,500 sq. ft. and the butchery incorporated into a fresh pre-packed meat section at the back of the hall. The original butchery is under reconstruction and will shortly emerge as a traditional service greengrocery, enabling Bath Co-operative customers to do all their shopping under one roof.

The food hall itself follows the general trend towards brighter decor, without being too "ultra modern". The walls are finished in a light grey-blue and this colour is carried through on the wall shelving and on the Formica finish of the extremely attractive and unusual gondolas, which were, incidentally, designed by C.W.S. Works Department. By way of contrast, the refrigerated

display counters, which take up roughly half of the hall, are finished in a darker shade of blue.

In addition to the usual dry goods and groceries, Bath Co-operative are following the trend of most new stores in the supermarket class and are offering to their customers a far wider range of goods than one hitherto expected to find in a store devoted mainly to the sale of groceries and provisions. Two of the four gondolas are given over entirely to the display of commodities such as cosmetics, patent medicines, stationery, sewing materials—even nylon stockings, whilst on another stand, specially designed for the purpose, there is an extremely colourful display of Polythene household articles—brushes and brooms of all sizes and for all purposes, bowls, buckets, cups, saucers, etc., etc.

Perishable items are displayed in Hussmann refrigerated display cabinets, of which there is 81 feet in all. One 24' case with mirrored superstructure runs along the back of the store and constitutes the meat section. 12' of this is devoted to the display of English meat, 12' to that of foreign produce. All meat is pre-packed and clearly marked as to price, cut, quality, etc., preparing and packaging being carried out on the premises. Self-service of meat is an innovation at this branch and many customers still prefer to



be served rather than to help themselves, but the new method is undoubtedly being accepted more and more each day.

Two further 24' Hussmann cases run back to back along the length of the store, one of these being devoted entirely to the display of pre-packed bacon, in joints or rashers. There seemed to be no particular reason for devoting such a large amount of space to this one commodity, so one must assume that the inhabitants of Odd Down are phenomenally large bacon eaters. The other 24' of refrigeration is devoted to fats and cheeses, etc. One 9' delicatessen counter, also Hussmann, and run on traditional assisted service lines, completes the refrigeration in this store, with the exception of a Lec frozen food case.

There are two checkouts, well spaced to prevent congestion during peak shopping hours and even on mid-week afternoons they are kept busy, which seems to indicate that Bath Co-operative Society have little to worry them over their new venture at Odd Down.

## FARMER - RETAILER

A NEWLY OPENED self-service store which, although small perhaps in comparison with some of the large multiple super-markets, has a charm and efficiency of its own, and is as up to date as any in England, is to be found in Aylesbury, Buckinghamshire.

The main object of this store, which is called "Farmfare" and is actually owned by a farmer, is to provide customers with mainly locally bred meat which is prepacked on the premises. Down one side of the store are two refrigerated self-service cases which are devoted to meat cuts of every sort, each clearly marked with the weight, price and a description of the meat. Above the cabinets are colourful cut-outs showing the various joints and how to recognize them.

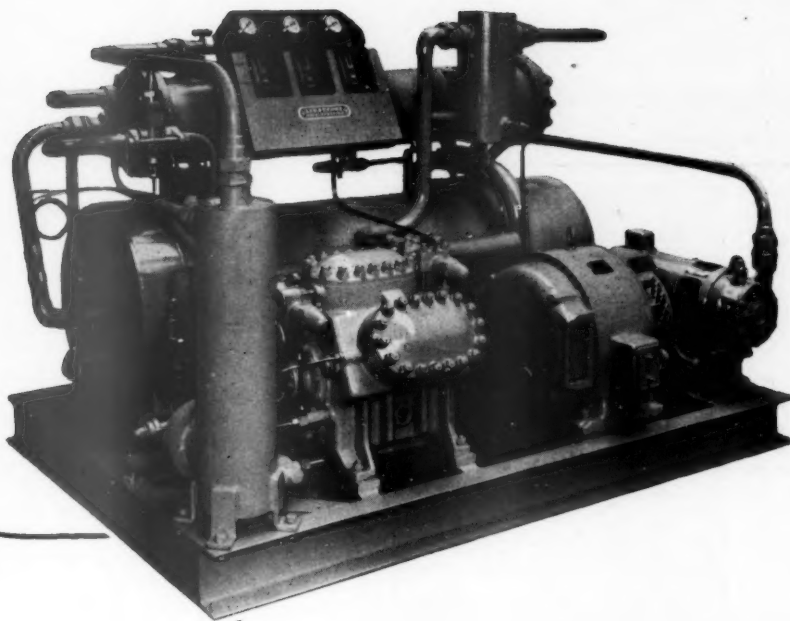
Other foodstuffs are not forgotten; there is a delicatessen counter in which is incorporated a 3-ft. refrigerated case, at the far end of the store, whilst opposite the meat cases is a frozen-food case and a prepacked food case, which offer a very varied selection. Tinned, bottled and other non-perishable goods are displayed all round the store, ready for the customer to select. All the foregoing refrigerated cases are operated by Prestcold equipment incorporating Super-Presmetic units.

The accent is on hygiene in the cutting and

packaging room situated below the store, where two butchers and two girls for the packaging are employed. The meat is stored in a Prestcold 850-c.ft. cold room, the equipment for which includes the unique Prestcold "Defrostermatic"

(Continued on p. 909)





**NEW**

# PACKAGED WATER CHILLER

We illustrate our 10 horse power packaged water chiller which is being exhibited at the Brussels World Exhibition 1958.

This unit is the smallest of an entirely new range of packaged water chillers which are available in graduated capacities up to 100 horsepower.

Complete and ready for connecting to water and electrical supplies, why not save time, money and above all space by specifying Lightfoot Packaged Water Chillers?

The Engineering Centre Group Stand

**BLOCK C**

BRITISH INDUSTRIES PAVILION

*by*



## LIGHTFOOT REFRIGERATION



*leaders in specialised installations for over 70 years*

THE LIGHTFOOT REFRIGERATION CO. LTD., ABBEYDALE ROAD, WEMBLEY, MIDDLESEX

## Refrigerated Road Transport Review



### PLANT FOR MOBILE REFRIGERATION

**R**EFRIGERATION service creates special demands on the engine of the vehicle used for the transport of perishable foodstuffs; the engine is, in fact, a substitute for an electric motor.

Much of the emphasis in small air-cooled engine design has been shifted towards inexpensive light prime movers. These engines serve well in a wide variety of applications which run a limited number of hours a year. They are neither intended nor suitable for continuous duty. The difference between these small engines and engines for refrigeration is service life.

The engine for mobile refrigeration must run continuously for many hours while being fed only fuel and oil on the road or at a layover point. If 1,000 hours of running is equivalent to roughly 50,000 miles, the engine may run the equivalent of 200,000 miles a year.

Since the use of the engine is for refrigeration, it will be expected to run most when the weather is the hottest. Under high ambient temperature conditions, the engine will be working the hardest, and

**A**T the Commercial Motor Show to be held at Earls Court, London, from September 26 to October 4, Mann, Egerton & Co. Ltd., of Norwich, will be showing several vehicles of interest to the refrigeration, food and allied trades. These exhibits will include a refrigerated box van body on the Austin 2-ton forward-control chassis, a 7-ton refrigerated container, and a standard insulated conversion of the Thames 15-cwt. van.

A point of particular interest is that the refrigerated container, refrigerated van and insulated van are *standard* production models and offer the advantages of mass production, quick delivery, competitive prices and the ready availability of replacement parts—to operators in a highly specialized field.

The box van has refrigeration by hold-over plates, two to each side of the body, with a compressor unit fitted to the cab.

The standard refrigerated container is also mechanically refrigerated, the unit being sited in a separate compartment at the front of the container.

The M.E. insulated conversion on the Thames 15-cwt is specially suited to distribution to retailers, etc. It is believed to be the cheapest new insulated vehicle on the market.

at the same time be the least able to deliver maximum power.

Starting creates another unusual requirement. The engine must start unattended on the demand of a thermostat. This requires the utmost of the starter, ignition system, and the fuel system. Manual starting aids are not available on the refrigeration unit; the engine must start, come up to speed, and disengage the starter automatically.

There are many problems facing the engine manufacturer when designing for truck refrigeration; he cannot solve them all since they are often affected by engine installation. It is necessary that the engine manufacturer and refrigeration equipment manufacturer work closely to provide the best installation. Some of the problems in this connexion were recently discussed by David W. Onan II of D. W. Onan & Sons Inc. to the Society of Automotive Engineers Inc., U.S.A.

#### High Ambient Temperatures

The first problem is high ambient temperatures. High temperatures reduce the maximum power output of the engine often when the most refrigeration capacity is needed. The results of high ambients are longer running times, higher oil temperatures which lead to more rapid breakdown of the oil, and sticking rings and valves.

The cure is to cool the engine with the coolest



outside air available, and eliminate the possibility of re-circulating hot air off the engine or refrigeration condenser back to the engine air inlet. The refrigeration unit must be constructed to eliminate re-circulation when standing still as well as when the truck is in motion. The air cleaner should be placed adjacent to a fresh air inlet in the housing and away from hot air off the engine or condenser.

### Starter Requirements

The refrigeration unit must make many thousand successful, unattended starts, continue cranking after a false start, and stop cranking only after the engine has started and reached a given rpm. In addition, the starter must be trouble-free.

There are two approaches to this problem which require as few parts as possible to engage or overrun. The first is a cranking motor permanently and directly connected to the engine crankshaft. This starter may be shut off by sensing its back e.m.f. as the engine approaches running speed. The second is a motor connected to the crankshaft through an overrunning clutch. This motor can be smaller than the one described above and turn at a very high rpm. Its speed is reduced through gearing to give a normal engine cranking rpm. This second method uses gears completely enclosed in the crankcase, lubricated by crankcase oil, and constantly in mesh. This starter is shut off by a switch on the governor arm as the engine nears running speed.

### Speed Regulation

The engine should maintain a reasonably constant speed over the load range. While this speed is not critical, it should not vary more than 100 rpm. from no load to full load. The governing system must not be sensitive to outside influences such as truck motion which would cause surging of the engine or flooding of the carburettor.

In the development of the Kab Kooler, truck cab air-conditioner, it was found that the engine would stop when being run over very rough roads. It was determined that the governor arm was being influenced more by the road than the governor. Calculations based on this and subsequent tests showed loads in excess of 11 G's imposed by the truck. The result was the lightening of the arm and linkage to remove unwanted inertia from the system.

Fuel must be moved from the tank to the carburettor by one means or another. Gravity systems are inconvenient because the engine is usually near the top of the trailer; and dangerous because carburettor float valves are merely flow limiters, not fuel shut-off valves.

Generally, the engine-driven fuel pump is adequate. In cases where suction lifts exceed 6 ft.

or the tank is located at some distance from the engine, an auxiliary electric pump at the tank is required. A check valve to prevent fuel run back to the tank during shut down periods may also be helpful in this situation.

### Considering LP Gas Fuel

From an engine standpoint, LP gas is an excellent fuel. It leaves no lead deposits in the cylinder heads and prolongs the time between oil changes. It eliminates some fuel handling problems since it is a vapour under pressure at the carburettor. Vapour lock cannot occur and the product is usually free of moisture and other contaminants. Since it is a liquefied gas under pressure, some safety precautions must be taken. Other considerations are the weight of the fuel tank and availability of the gas on the road.

### Special Problems

Engine noise and vibration cannot be neglected. The truck may stay overnight or weekends near residential areas. An engine running without muffling can be very objectionable on a hot summer night. Engine vibration, because of its relatively high frequency as compared to road vibration, may cause accelerated fatigue in refrigeration plumbing. Inherent engine smoothness is desirable.

A large engine oil capacity is needed. There should be no less oil capacity than the engine will normally use between full fillings. This capacity may well be large enough to make it unnecessary to add oil between changings. This means oil in the sump is nearing the low point about the time the oil would normally be changed.

### Engine Life Factors

Engine life depends on the quality and ruggedness of the parts designed into it, the adequate sizing of the engine for the load, and the thoroughness of periodic maintenance. Engine manufacturer, refrigeration equipment manufacturer, and user, all share the responsibility.

Engines for refrigeration service should have Stellite-faced valves and seats, valve rotators, heavy duty bearings such as those of aluminium, full pressure lubrication, and a substantial overload factor built into each part. Few, if any, of these items are found in the average small engine.

The engine load should not exceed 60 to 70 per cent. of maximum corrected brake horsepower for continuous service. This load provides an ample safety factor while going higher shortens service life and increases maintenance costs. It is not always easy for the refrigeration equipment manufacturer to determine what the exact engine load is, particularly when the engine may be driving

several accessories as well as the compressor. The engine manufacturer usually has the equipment to do this. Periodic inspection should include air cleaner service, spark plug cleaning and regapping, lead and carbon removal, and breaker point inspection at regular intervals. A good quality detergent oil should be used along with "regular" or unleaded fuel if it is available.

Adaptability of the engine to the refrigeration equipment manufacturer's product is next in importance. The location of power take-off shafts, frequently at both ends of the crankshaft, and accessories such as starter, breaker points, carburettor and other things which get in his way are his concern.

Some of the factors of adaptability are the engine's overall dimensions and weight. In many instances the space provided for the refrigeration unit is dictated by the truck tractor and trailer manufacturer. It must fit on existing equipment as well as the new. The engine may well be the determining factor in overall length. The most efficient use of length is in the radial engine; the next, opposed cylinders or vee; and third, in-line. Engine weight is also important. Since the engine is part of the refrigeration unit, it subtracts from the truck's payload. Light metals are preferable whenever construction and economics make them possible.

The ultimate user is most concerned with engine reliability, part availability, and accessibility for maintenance. The refrigeration equipment should be designed for easy removal of spark plugs and cylinder heads. Breaker points, coil, and ignition condenser should be easily accessible for inspection. The air cleaner should be located near an access door. Oil fill and drain points should be clear of other structure which would make them inconvenient.

If service is not made simple for the user, he may neglect it. The responsibility for convenience is shared jointly by the engine manufacturer and the refrigeration equipment manufacturer. They must co-operate and be willing to make changes towards this end.

### Engine Design Consideration for the Future

The demand is naturally for longer life, more horsepower per pound, and lower cost per Btu of cooling. To meet this demand there are several logical paths of investigation.

Overhead valve engines are more efficient and require less maintenance. For a given displacement they are somewhat more expensive, but in cost per horsepower they need not be. They may be run continuously at higher speeds than an L-head engine and have a higher thermal efficiency. They require less frequent carbon and lead removal and consume less oil.

Combining the engine and refrigeration compressor is a logical step for the engine manufacturer. Compressors look something like engines when you consider their internal parts. The direct connected engine-compressor package requires no couplings or belts which could be items of maintenance. This package contains fewer parts than two separate units. The compressor has no bearings since its crank throw is connected directly to the engine crankshaft. One seal keeps refrigerant and compressor oil from engine oil.

The engine and compressor are matched to each other in capacity, take up little more space than the engine with a power take-off shaft, and cost less than separate units to install. Another important thing to the customer is that the responsibility for performance lies with one manufacturer, not two.

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## Giant Frozen Food Carrier

**A** SKILFULLY designed 14-ton fully insulated vehicle, the size of a double-decker bus, is the newest addition to the rapidly growing Birds Eye fleet of delivery vehicles and will be used in the fast-developing scheme which this well-known frozen food firm has planned for the nation-wide distribution of its products.

Where food is concerned, speedy bulk haulage

is an unquestionable necessity and always has been but the meteoric rise of quick-frozen foods has created new requirements in transport. With more than 40,000 quick-frozen food stockists in the country, Birds Eye have on their hands a big distribution problem. Briefly it is this; quick-frozen foods of all kinds must be moved quickly and efficiently—and with as little time lag as



*Magnifying Glass moulded in Lustrex GP by Combined Optical Industries Limited.*

## For greater clarity—Lustrex GP

Lustrex General Purpose—like all other grades of Monsanto Lustrex—is a HIGH-QUALITY polystyrene, and refrigerator boxes moulded in it are first-class, crystal-clear products. That's why you should insist on Lustrex General Purpose—clearest of all polystyrenes.

- *Lustrex General Purpose is also available in a wide range of standard colours; or, special colours can be accurately matched within a few days.*
- *There is a grade of Lustrex for every job in polystyrene.*

**For the clearest refrigerator boxes—insist on Lustrex GP**

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Regd.

Birds Eye's 14-tonner



possible—from factory to cold store to retailer.

A huge tonnage has to be moved each week, long routes have to be covered and, most important of all, goods must be got there in perfect condition. To ease the marketing problem, big cold stores are sited at strategic points through the country from where food is again re-routed to over 40 tactical cold stores in further areas, which, in turn, deliver daily—or never less than thrice weekly—to local retailers.

The 14-ton vehicle begins to answer the problem. The forerunner of more to come, it has been put into service to facilitate and improve the temperature control of bulk deliveries of quick-frozen food from the factories to the cold stores throughout the country.

But one of the most searching features in planning a big scale road movement of their product, to be undertaken over long distances, was to marry certain technical necessities with styling.

For with a frequent shuttle service operating on the main roads of the country, the opportunities that service would provide for product impact and brand recognition were obvious.

So in designing the new livery for their road fleet, Birds Eye had to combine two main factors—practicability and company prestige.

With the co-operation of the industrial designers Richard Lonsdale-Hands Associates Limited and the coach builders Mann Egerton & Co. Limited this has been successfully achieved. Using the company colours of blue, white and red and with

aluminium coachwork, the result can now be seen in the first four vehicles to be treated in this manner.

The new mobile cold store—for such it really is—is a notable achievement in British design. Weighing 24 tons when fully loaded, it incorporates a newly designed and patented system of cooling in the refrigerated body, which maintains the product temperature at 0°F. over a period of 24 hours, using carbon dioxide as a refrigerant.

The co-ordinated appearance of the vehicle is a triumph of technical ability, practical workmanship and good design. From an illuminated front head board on the cab, a two-stage flowing contour along the aluminium body was developed, sweeping in a continuous line around the tail of the vehicle. Integration of the cab with the body was achieved by designing a Luton type body.

With the lettering and bird in flight silhouette set in the sweeping lines of the design, perfect brand recognition was established, giving at the same time a great feeling of speed and urgency for the products carried.

A note of unusual interest is the inclusion of a destination board on either side of the vehicle. This interchangeable addition indicates the route the vehicle is travelling and the variety of frozen food carried; for example, when operating from Grimsby with a full cargo of fish the message will read "Fish Fillet Special—Grimsby—London" and as further vehicles come into use on other roads, poultry, vegetables, fish fingers or any one of the more than 30 items in the Birds Eye range



of products will make their debut on the board.

Within the cab special attention has been paid to the comfort of the driver. Well upholstered seats in blue leather, lockers for personal belongings and food, first-aid kit, fire extinguisher and radio set are included in the fittings and special dials enable the driver to read and control the temperature in the insulated interior of the truck.

#### 2½-Ton Ford 4D Insulated Vehicle

The newly designed livery is also to be found on 2½-ton Ford 4D insulated vehicles, operated on behalf of Birds Eye Foods Limited by S.P.D. Limited.

These vehicles, which are called upon to make anything of up to 60 calls per day, are fitted with two special interlocking doors. The inner door cannot be opened until the outer is closed, and *vice versa*. With a high number of deliveries meaning that the doors are opened and closed often in one round, this ingenious air lock ensures very good thermal efficiency during the working day. The other vehicles dressed in the new livery are insulated Austin 152 omnivans which are used for general distribution duties, similar models not insulated for display purposes, and a 10 cwt. Austin A55 van which is utilized on general duties.

#### GENERAL SPECIFICATION OF 14-TON INSULATED VEHICLE

##### Chassis/Cab

6.8.(G) model E.R.F., eight-wheeled chassis, powered by the 6.L.W. Gardner engine, with double drive.

The chassis is fitted with Tecalemit sydnronic automatic greasing unit with 60 points. The vehicle is clad with 900 × 20X Michelin tyres.

The battery capacity has been increased to cater for the increased load of electrical equipment to 230 amp. hours whilst the dynamo is capable of a 30 amp. charging capacity.

##### Insulated Container

The insulated container which is permanently secured on to the chassis, is capable of carrying 14 tons of quick-frozen foods, maintaining a product temperature of 0°F. over a period of 24 hours using solid carbon dioxide as the refrigerant. It is intended to use the vehicle for palletized goods and 10 pallet loads may be carried.

The internal dimensions of the container are 7 ft. 10 in. × 7 ft. 1½ in. × 22 ft. 9 in.

Insulation is 4 in. of expanded polystyrene, Isocolor, on the walls and roof and 3½ in. on the floor. 1½ in. dunnage is provided on the walls and doors to ensure full air circulation around the product. Double doors are provided which are



Photograph shows range of Birds Eye bulk transport and delivery vehicles with surface design produced by Richard Lonsdale-Hands Associates Limited as design members of PLAN (International). Design of the smaller vehicles followed success of the original conception of the 14-ton bulk transport van. Left to right: 14-ton vehicle, consisting of 18-ft. wheel base ERF; 2½-ton Ford Thames truck; A152 Austin 15-cwt. Omnivan; A55 Austin 10-cwt. van.

fully vapour- and heat-proofed and open the full width of the container to allow for palletized loading.

Refrigeration is provided by the sublimation of solid carbon dioxide on a patented closed circuit, the rate of sublimation being controlled by six centrifugal fans. The resultant gas is removed

to atmosphere through piping so that the presence of carbon dioxide is entirely precluded from the interior of the container. Six units, each designed to hold 100 lb. of dry ice, are placed in pairs inside the vehicle.

Coachbuilders: Mann Egerton Ltd., Norwich.  
Insulation: Veedip Ltd., Slough, Bucks.



## REFRIGERATED SERVICE

### ROME - - LONDON

**W**HAT must be surely one of the largest refrigerated road trailers in Europe (it could almost certainly be described as the longest) is the type now being operated by Frigo European Road Services, in conjunction with British Beef Company, a subsidiary of Weddel's. There are four of these trailers at present running between the major cities of Italy and the U.K. and twice weekly visits are made to these shores. It is planned to add two more vehicles to the service by the end of the year and by next summer to have a further four in commission.

It is an interesting feature of the service that the refrigerated trailer body makes the complete run across Europe while the four countries involved (Italy, France, Belgium and England) provide the towing tractors.

Italian fruit is brought to this country while, on the return trip, chilled beef is consigned. This perhaps is an unusual feature since beef is in short supply at the moment but the fact remains that the Italian housewife is willing to spend more than her counterpart in this country on cow beef.

The trailers are built in Italy, as can be seen from the illustration, and are fitted with Kelvinator

condensing units driven by self-contained petrol engines. Temperatures down to 14° F. are available if necessary.

On the basis of the present method of loading, 15 tons of fruit are shipped per journey to these shores and 13 tons of beef are sent back. Strangely enough, the beef sides are stowed horizontally in three tiers to enable the overall height of the vehicle to be kept to a minimum. This is 12 ft. 3 in., while the length is 33 ft. and the width 8 ft.

The journey from the fruit-producing areas in Italy to Covent Garden, London, takes 4½ days. Reading abattoir is at present being used as the loading point for British beef and the trailer is then towed to Tilbury for shipment to Antwerp, through France to northern Italy.

Five hours before unloading on the return journey, two plug hatches forward and two hatches aft are opened for ventilation.

An all-in rate and full insurance (covering the expected market price of the produce) are provided by the operator, Signor Carbest Di Fideli. This is said to be lower than the comparative rate charged by the railways.

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**electric  
motor**

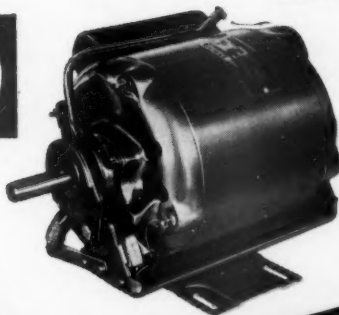


Before you start work on your plans for refrigeration applications which call for compact, high-efficiency electric motors ... consult Delco Motor engineers.

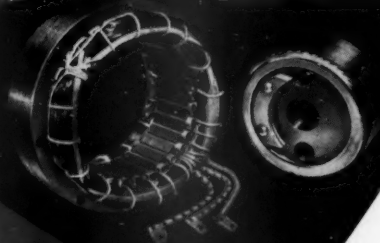
The Delco range includes motors to meet most modern requirements. These versatile motors are so designed as to be easily adapted to suit your individual needs.

Write for descriptive leaflet featuring motors for use in—  
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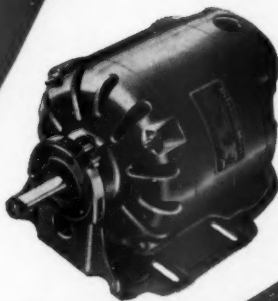
DELCO 650 Type



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# The Institute of Refrigeration Bulletin

*Institute Headquarters: New Bridge Street House, New Bridge St., London, E.C.4 (CENTral 4694)*

## CONTROL ENGINEERING

A SERIES of lectures which may be of interest to Institute members is to be held at Battersea College of Technology during the 1958-9 session.

The courses are intended to introduce engineers, physicists, chemists and persons of similar interests to the possibilities of automatic control. Before the variables of a process can be controlled they must be measured and so the lectures commence with a measurement series on Thursday nights, dealing with the basic variables: Temperature, pressure, level and flow. In this series are also included two lectures on the subject of the sizing of valves.

Parallel with the measurements series is one on the mathematics of control engineering on Monday nights, which is designed to bridge the gap between the type of mathematics taught at B.Sc. (Eng.) level and the Laplace transformation and vector methods now common in servo literature.

The measurement and mathematical series occupy the autumn term and pave the way to the control series which take up the Thursday evenings of the spring term. This series presupposes a knowledge of the primary measurements dealt with in the measurements series; however, it does not require a mathematical background higher than B.Sc. (Eng.) level. For the majority it would probably be advisable for them to take the mathematical series of the autumn term in a succeeding year after they have taken the control series.

On Monday nights during the spring term lectures are given on the measurement and control of conductivity, pH, viscosity, humidity and radio-chemistry.

The majority of the lectures will be supplemented by the demonstration of actual control and measurement apparatus loaned by the participating firms. The lectures on control theory will be further supplemented by a four-stage level control analogue under laminar flow conditions, which has been specially constructed in the department to illustrate the behaviour of the various types of commercially available controllers and to demonstrate the effects of different types of process characteristics.

Participants should have the equivalent of a B.Sc. degree, or H.N.C. or professional institution status. Knowledge corresponding to such standards will be assumed, but no prior knowledge of the process field will be assumed. The course is not suited for those interested only in instrument maintenance.

Each evening session will commence at 7 p.m. The lecture will finish by 8.30 p.m. and the remainder of the evening up to 9.30 p.m. will be given over to discussion and demonstrations.

Applications for enrolment should be made to the secretary, Control Engineering Course, Battersea College of Technology, London, S.W.11.

## THE INSTITUTE LIBRARY

The books in the Institute library are classified under two main headings. There is a section devoted to reference books, which comprises proceedings, periodicals, annuals, etc. The books in this section may not be taken away from the Institute office but are available for reference provided that a prior appointment is made.

The other section consists of text-books which may be borrowed, for periods not exceeding 14 days, by members resident in the British Isles.

For the information of members a list of books in the library is given below:—

### Reference Section

#### *Proceedings and Periodicals*

Proceedings of the Institute of Refrigeration—1900 to date.

Proceedings of the 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th and 9th International Congresses of Refrigeration.

Proceedings of the Victorian Institute of Refrigeration—1920-35 (Australian).

Literature of the Food Investigation Board—1918 to date.

Annual Report of the Smithsonian Institution—1918, 1921-36, 1938-9.

The Engineering Index—1927-32.

Refrigeration Abstracts—1946 to date (American).

Bulletin of the Institut International du Froid—1910 to date.

Modern Refrigeration (formerly entitled Cold Storage & Produce Review and Cold Storage & Ice Trades Review)—1898 to date.

Frozen Foods (formerly entitled Quick-Freezing)—1948 to date.

Ice and Cold Storage (incorporated in Modern Refrigeration, 1939)—1912, 1915-39.

World Refrigeration—1950 to date.

Journal of Refrigeration—1957 to date.

Ice Cream Industry—1926-41.

Refrigeration, Cold Storage & Air-Conditioning—1930 to date (Australian).



The Refrigeration Journal—1947 to date (Australian).  
 Refrigerating Engineering (formerly A.S.R.E.)—1905 to date (American).  
 Ice & Refrigeration—1912-49 (American).  
 La Revue Generale du Froid—1948 to date (French).  
 Kältetechnik—1952, 1953, 1956 to date (German).  
 Revista Argentina Del Frio—1952 to date (Argentinian).  
 Industria Conserve—1955 to date (Italian).  
 Revista de Ciencia Aplicado—1956 to date (Spanish).  
 Revista del Frio—1956 to date (Spanish).  
 Kylteknisk Tidskrift—1952 to date (Swedish).  
 Nederlandse vereniging voor Koeltechniek Mededelingen—1954 to date (Danish).  
 Russian Refrigerating Journal—1957 to date (Russian).

*Periodicals, etc., kept unbound (for the last two years only)*

Mechanical Engineering (American).  
 Heating & Air Treatment Engineer.  
 Transactions of the Institution of Engineers-in-Charge.  
 Voice of Industry.  
 Midwest Engineer (American).  
 The Journal of the Institution of Engineers, Australia (Australian).  
 Heating (formerly entitled The Industrial Heating Engineer).  
 Machinery Lloyd (European Edition).

#### *Year Books and Handbooks*

American Public Refrigerated Warehouses — 1951-2.  
 Handbook of British Refrigeration Material—1957.  
 British Standards Year Book—1958.  
 Consulting Engineers' Who's Who and Year Book—1952.  
 Year Book of the Heating & Ventilating Industry—1957.  
 National Federation of Cold Storage and Ice Trades Year Book—1951 to date.  
 Shipowners, Shipbuilders and Marine Engineers Directory—1939.  
 British Engineers' Association Handbook—1954.  
 National Federation of Fruit and Potato Trades Ltd., Handbook and List of Members—1958.  
 London Meat Trade Annual—1955.

#### **Lending Section**

<i>Refrigerating Engineering Publisher or Author</i>	<i>Title</i>	<i>Publication date</i>
A.S.R.E.	Refrigerating Data Book & Catalogue	1933
A.S.R.E.	Refrigerating Data Book & Catalogue	1936

<i>Refrigerating Engineering Publisher or Author</i>	<i>Title</i>	<i>Publication date</i>
A.S.R.E.	Refrigeration Data Book & Catalogue	1938
A.S.R.E.	Refrigeration Data Book (Basic Volume)	1951
Authenrieth & Brandt	Practical Ice-making	1931
Danish Refrigeration Manuf'rs	Laerebog for Kilemontorer (in Danish)	1947
Greene	Elements of Refrigeration	1916
Griffiths	Refrigeration Principles & Practice	1951
Hirsch	Die Kaltemaschine (in German)	1924
Jordan & Priester	Refrigeration & Air Conditioning	1949
Lorenz & Heime	Neuere Kuhlmaschinen (in German)	.....1913
Luhr	Mechanical & Refrigerating Engineers' Handbook	1913
Macintire & Hutchinson	Refrigeration Engineering	1950
Matthews	Elementary Mechanical Refrigeration	1912
Motz	Principles of Refrigeration	1947
Pitts	Thermal Insulation of Structures	1941
Plank	Amerikanische Kältetechnik (in German)	1929
Schmidt	Artificial Ice-making & Refrigeration	1907
Selfe	Machinery for Refrigeration	1900
Sharpe	Refrigerating Principles & Practice	1949
Sparks	Theory of Mechanical Refrigeration	1938
Stetefeld	Die Eis & Kalteerzeugungs (in German)	1912
Venemann	Refrigeration Theory & Applications	1946
Voorhees	Refrigeration Machines : Compression, Absorption	1909
Voorhees	The Absorption Refrigerating Machine	1924
Voorhees	Indicating the Refrigerating Machine	1899
Wallis-Tayler & Gerard	The Pocket Book of Refrigeration and Ice-making	1950
Wallis-Tayler	Refrigeration, Cold Storage & Ice-making	1912
Williams	Mechanical Refrigeration	1927
Wostrel & Praetz	Household Electric Refrigeration	1948

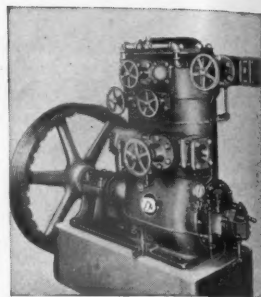
(To be continued)



## COMMERCIAL AND INDUSTRIAL

### SECTION

#### Manufacturers' and distributors' news



The whole of the ordinary share capital of **Air Control Installations Ltd.** has been acquired by Beyer Peacock & Co. Ltd., of Gorton, Manchester. Mr. F. D. Moul, B.Sc., A.C.G.I., A.M.I.MECH.E., will shortly be retiring from his position as chairman and managing director, but will continue to be associated with the company in an advisory capacity, as director and president of the company. The general policy of the company will remain unchanged, and it will continue to manufacture its wide range of air treatment equipment as heretofore. The membership of the successful Beyer Peacock Engineering group will greatly assist Air Control Installations Ltd. in their continued expansion and the development of new air treatment products for which they have been well known for over 20 years.

\* \* \*

Three new appointments are announced by **Frigidaire Division of General Motors**. Mr. Douglas A. Cole, formerly the company's press officer, has been appointed sales promotion manager, and Mr. Clive Birch, previously managing-editor of the *Bucks Examiner*, has been appointed press officer, both appointments being effective from August 18. Also announced in the sales promotion department is the appointment of Mr. L. J. Bantick as sales training officer from the same date.

\* \* \*

On September 1 The Hotpoint Electric Appliance Co. Ltd. changed its name to **A.E.I.-Hotpoint Ltd.** The reasons for this step are as follows: The former title was unnecessarily long; most people now know that "Hotpoint" means electric appliances; the new title reflects membership of the A.E.I. group of companies.

Mr. F. R. Willoughby, managing director of The Industrial & Mining Supplies Co. Ltd., and Kieselguhr Producers Ltd., has been appointed to the board of the parent company, S. Instone & Co. Ltd., who own and control Instone Lines Ltd., London/Antwerp steamship service and other companies. It will be remembered that Messrs. Instone were the pioneers in civil aviation. The Industrial & Mining Supplies Co. Ltd. are the well-known suppliers of Portuguese insulation corkboard and all cork products and represent "Corca" Fabrica de Aglomerados de Cortica Lda, Lisbon, one of the "Isola" companies. They also represent Société des Silices Fossiles de France, for Kieselguhr (Diatomite) Filter Aid and the great shipyards of Kockums Mekaniska Verktads A.B., Malmo, for their Tyfon & Supertyfon (steam, air, electric and hydraulic controlled) whistles for ships of every tonnage, diesel locomotives, etc. Mr. Willoughby has been associated with Instone's for nearly 40 years.

\* \* \*

Although net sales and earnings of **Ranco Inc.** for the quarter ended June 30 evidenced the depressed and highly competitive conditions in the United States, shipments from plants in Scotland and Italy continued to grow, the company reports. This favourable trend in sales will require further expansion of their manufacturing facilities abroad, the firm declared. Consolidated net sales for the quarter amounted to \$6,508,570 as compared with \$7,826,773 in the same quarter of 1957. For the first nine months of the fiscal year consolidated sales were \$20,096,910, down from \$23,942,351 a year ago.

\* \* \*

The **Atoplast 20 Mobile** equipment illustrated herewith has been conceived in order to take full advantage

of the molecular changes that take place in the process of hot spraying when applied to bitumen (including tar and pitch), thermoplastics, and various wax compounds. The process, briefly described, is the absolute control of the temperatures of the



"raw material" before and at the actual time of spraying, that is the temperature at which the material comes into contact with the surface being sprayed. In other words it is possible to melt the "raw material" at a different temperature, usually higher, than the temperature of spraying and it is between these two differences of temperature that the molecular reconstruction of the product takes place when it comes into contact, at the moment of spraying, with the oxygen of the air; this is particularly true in the case of hydrocarbons where the oxygen of the air combines with and removes the hydrogen from the bitumen hydrocarbons. With the "Atoplast 20" it is possible to spray bitumen on surfaces such as polystyrene, cork, metal, etc., without damaging the surface due to the construction of

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Dryers using Molecular Sieves absorb five to ten times the moisture collected by silica-type desiccants. In addition, Molecular Sieves last longer . . . you will have fewer replacements to make; and because dryers can be made smaller, they are easier for you to carry . . . easier to stock . . . their compactness makes them easier to install.

the difference in **dryer** performance

Unaffected by Oil or Refrigerant. UNION CARBIDE Molecular Sieves unique crystalline structure makes it impossible for them to become clogged with oil or refrigerant. The entire surface area is used to absorb moisture . . . giving a longer and more effective life to every dryer.

For full information about grade availability and technical assistance please contact Section M-9.



molecular sieves

CHEMICALS DIVISION  
**UNION CARBIDE LIMITED**  
103 MOUNT STREET, LONDON, W.1

The term "UNION CARBIDE" is a trade mark of Union Carbide Corporation

the spray gun which has two nozzles both for spraying the material in use and also for a stream of air, either hot or cold as desired, simultaneously, dependent upon the surface being sprayed. Examples of this are available for inspection at any time. Agents for this French plant are Charles E. Douglas & Co. Ltd., 86, Strand, London, W.C.2.

\* \* \*

**Igranic Electric Co. Ltd.**, of Bedford, have won a N.Z. contract in the face of international competition. The order, secured through the company's New Zealand agents, Tolley & Son Ltd., is for the supply of centralized motor control panels and auxiliary control boards for a freezing plant (Alliance Freezing Co. Southland Ltd.) in Invercargill which embodies new design features. Delivery of the equipment is scheduled for early 1959 and is valued at £50,000.

\* \* \*

**I.C.I. Plastics Division** will be holding three exhibitions in September and October to illustrate the industrial uses of nylon. The exhibitions, which will be seen in Birmingham, Cardiff and Glasgow are designed to show engineers and designers some of nylon's most recent industrial applications. Most of the exhibits will be injection moulded, but a number of articles produced by extrusion and other techniques will also be on show. The first exhibition will be held in the Chamber of Commerce Assembly Room, Birmingham, on September 23 and 24, the second at the Angel Hotel, Cardiff, on October 14 and 15 and the third at the Grand Hotel, Charing Cross, Glasgow, on October 29 and 30. Included in the articles which will be in the exhibition will be a refrigerator.

\* \* \*

The Plax Corporation of Hartford, Connecticut, U.S.A., manufacture Polyflex biaxially oriented polystyrene film. **Monsanto Chemicals Ltd.** has been sales agent for Polyflex in Great Britain since May 1, 1958. Polyflex film is made by extruding polystyrene. As the sheet is formed it is stretched in both the machine and the transverse directions to three times its former size, yielding nine times the original area. From this process the term "biaxial orientation" is derived. As in other

oriented materials, such as plastic monofilaments, the orientation gives extreme strength in the direction in which the strain is applied. The two-way stretch in Polyflex results in an extremely tough film with a high degree of rigidity. Polyflex film is laminated on to extruded toughened polystyrene sheet, to impart a surface finish which is not inherent in the toughened polystyrene itself. Polyflex is continuously laminated to the extruded toughened polystyrene immediately after the sheet leaves the extruder. Heat and pressure are used to effect the bond. Sheet produced in this way can be vacuum formed and can be used for quite deep draws, such as refrigerator liners, for example.

\* \* \*

A technical booklet providing information about Distrene-X expandable polystyrene and its use in lightweight foamed mouldings has recently been published by **British Resin Products Ltd.** Distrene-X is a special-purpose polystyrene for

rigid cellular mouldings, supplied in particle form. This material can be expanded to any shape by heating a suitable quantity in a hollow mould. The added blowing agent causes expansion to as much as 65 times the original volume. Mouldings made with Distrene-X have a thin outer skin of polystyrene with a non-porous internal cellular structure. They are rigid, lightweight, have relatively good mechanical properties and possess exceptionally low heat conductivity and good resistance to absorption and penetration by water. This combination of properties makes Distrene-X suitable for a variety of applications including low temperature insulation, buoyancy, protective packaging and display work.

\* \* \*

**Frostaire Refrigeration Co. Ltd.**, of Muswell Hill, have just announced that since the commencement of their recent expansion programme, of which MODERN REFRIGERATION readers are aware, 300

## Frozen Food Men Visit Prestcold



Mr. M. S. Ware, commercial sales manager of Prestcold (extreme left) with Mr. B. R. Wisden (centre), general sales manager of Smedley's, and a group of senior representatives from Smedley's Foods, during their visit to the Prestcold factory at Cowley.





cabinets and cold rooms have been sold. To mark this occasion the 300th cabinet (an Eldwood F.137 frozen-food display cabinet) was despatched in Frostaire's recent new addition to their fleet of vans and was given the personal send-off of the managing director of the company, Mr. Leslie L. Amesbury,

together with a member of the sales staff. In the background can be seen the showrooms and premises of the Tottenham Gas Board which has now been acquired by Frostaire and is in the process of being completely redesigned and decorated for an official opening soon.

\* \* \*

Pioneer users in this country of a new form of illuminated box-sign combining fluorescent and Neon lights are T. Wall & Sons (Ice Cream) Ltd. Installed on the ice cream company's Stonebridge Park (North Circular Road) supply depot when it was officially opened recently, was a new lighting unit in which all the lighting components are protected by Perspex. Forming a background to the "Wall's Ice Cream" motif is a yellow Perspex panel brilliantly lit by 14 G.E.C. fluorescent lamps, of 125 W., and 8 ft. long. The superimposed "Wall's Ice Cream" is formed of metal letters with white fluorescent Neon tube. Screening this is blue Perspex backed with a light-diffusing sheet. The unit is 16 ft. wide and over 8 ft. deep. The words "Stonebridge Park," in Egyptian italics, are of metal faced with yellow Perspex internally illuminated by single-line fluorescent tubing. This part of the sign is 35 ft. long. The whole was produced for T. Wall & Sons (Ice Cream) Ltd. by Neon Luminous Tubes (Lundsigns) Ltd.

#### OBITUARY

##### Alfred Porter, M.Inst.R.

His many friends in the refrigeration and air-conditioning industry will be shocked to learn of the death of Mr. Alfred Porter at the early age of 57. Mr. Porter died in the Middlesex Hospital shortly after an operation. He had been in ill health for nearly two years.

Alfred Porter spent his entire working life—44 years—in the industry. He started in 1914 as an apprentice at J. & E. Hall's, of Dartford, and remained with this firm until his 21st birthday in 1921. The call of the sea, a desire to see the world and also to gain practical experience on machines he had helped to design and build led him to join the Furness Holder Line and serve in their refrigerated ships in the meat trade between Liverpool and Buenos Aires. In two years at sea he rose from a junior position to second engineer.

He then returned to design work in the drawing office of Peter Brotherhood and later as a chief draughtsman to West & Beynon. In 1937 he commenced his association with L. Sterne & Co. Ltd., which lasted nearly 10 years. In the application field he was responsible for many important installations terminating with a modernization of the P.L.A. cold store plant.

His life's ambition saw its commencement in 1945 when he started his own company in a modest way in premises at the Great West Road, at Hounslow. Showing tremendous drive and initiative in those difficult days of supply, he produced a range of compressors many of which were used to help the ice cream industry back into production. Changing conditions led him to design larger equipment and develop and manufacture a complete range of components for the air-conditioning industry. This equipment offered a complete service to the heating and ventilating trade and its success led to the transfer of the business to much larger premises at Teddington in 1952. Prior to this, however,

in November 1949, he was involved in an accident which occurred whilst supervising the charging of a methyl chloride refrigeration plant in a large chemical factory. It is indicative of the character of the man to say that although he suffered severe injuries of a permanent nature he did not allow this to interfere with his activities in spite of being physically handicapped and in pain for many months.



This is evident by the large number of installations which incorporate his equipment all over the Middle East oil-producing area, the United Kingdom and many other parts

# Taylors of Mitcham



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of the world. Working under extremely arduous conditions his machines have proved to be as rugged in design as their creator's stamina.

Alfred Porter was not afraid to try out new methods provided he saw logic in their use and this is borne out by his introduction of the "Humiditrol" system of lithium chloride air-conditioning plant. Ingeniously he would often combine the chemical system with mechanical refrigeration to achieve special effects.

Later he entered the lower temperature field producing blast freezers and freezing tunnels incorporating mechanical handling devices.

Alfred Porter's indomitable spirit has left its mark on his colleagues who survive him at the Teddington Works and inspired them with determination to carry on along the lines over which they have been so ably guided for many years.

Alfred Porter leaves a widow and one son.

### FARMER—RETAILER

(Continued from p. 892)

which, installed outside the cold room, eliminates all the labour which was always required with manual defrosting and its attendant inconveniences. As with the other Prestcold equipment in this store, defrosting takes place automatically, at regular intervals, without any attention from the busy staff.

In addition to the joints on display in the shop, joints are also supplied to the customer's individual requirements. As can be imagined, the short period which elapses between taking the meat from the cold room, cutting, packaging and placing in the refrigerated showcases is very advantageous.

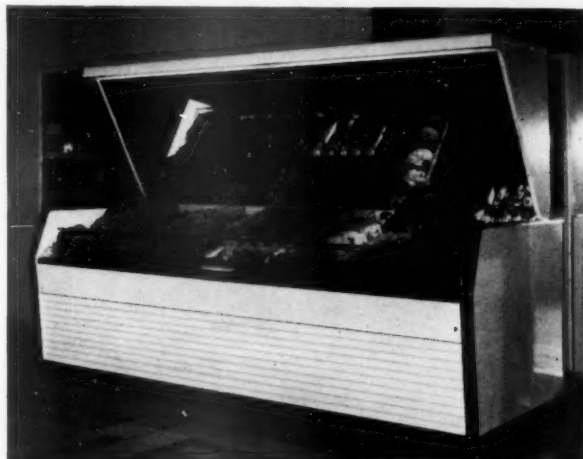
An interesting feature is the grouping of all the Prestcold Super Presmetic refrigeration units together in a corridor next to the cutting room. Here they are easily accessible whilst not taking up valuable space on the ground floor. Both the designing and construction of the store was carried out by Prestcold distributors, the Bedford Refrigeration Company Ltd., who have had considerable experience in shop lay-outs for the food trades.

### NEW HUSSMANN CASE FOR FRUITERS

The accompanying photograph depicts the latest addition to the Hussmann "mass display" range, the MD-M-V fruit and vegetable case. Designed specifically for the fruiterer, the sloping shelves enable fruit and vegetable mass displays of either wrapped or unwrapped produce to be built up to, and even above, the base of the mirrored superstructure, thus giving a continuous, unbroken display effect and doubling the display value. The shelves themselves are adjustable to several positions, whilst strip lighting concealed in the top canopy further enhances the appearance of the display.

In common with all cabinets in the "mass

display" range, the MD-M-V is available in units of 6 ft. and 9 ft., or can be multiplexed to form runs of from 12 ft. upwards. There is 15



sq.ft. of display in the 6 ft. model and 24 sq.ft. of display in the 9 ft.

The refrigeration method provides for substantial stacking of goods either packaged or unwrapped and relies upon a good volume of merchandise being displayed to ensure that the air is deflected up through the packages, where its velocity reduces as it nears the top of the display. The air then flows down to the front air discharge duct to return to the coil area for re-cooling.

The case is finished in white high bake stove enamel with stainless steel trims and the wear-resistant front panel comes in a choice of five colours and white.

### NEW LEC FROZEN FOOD CABINET

THE new Lec frozen food display cabinet, model FF.958, will be manufactured in quantity towards the end of the year. At a price of £175 10s. this represents excellent value and, holding as it does £30 worth of frozen food when fully loaded, it should quickly repay its capital cost in profit earned. The new FF.958 has been designed with freezing plates right across from the front to the back which tends to minimize the usual fluctuating temperatures experienced in this type of cabinet near the top. This cabinet gives excellent point-of-sale display in its large fluorescent-lit viewing area and trouble-free refrigeration is ensured by a fully sealed hermetic unit which carries a five-year warranty.

# Books on Refrigeration, Air-conditioning and Related Subjects\*

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## AUSTRALIAN NEWS LETTER

From Our Own Correspondent, Melbourne, Vic.

**I** THINK that I advised you that the new president of The Australian Institute of Refrigeration is Mr. H. G. Goldstein, chief sales manager and engineer of that very large refrigeration manufacturing company E.M.A.I.L., of Joynton Avenue, Waterloo, Sydney. He is a most progressive and energetic president.

We are gradually moving ahead with the James Harrison Foundation. The Victorian Division is the first to provide a bursary fund and choose a student for this year; South Australia expects to be moving in a similar manner very shortly. Victoria was fortunate in that the refrigeration manufacturers subscribed to a bursary fund a few years ago, with the idea of presenting a sum of money to one or two outstanding students in higher refrigeration education. The Victorian Government Education Department are assisting this scheme, through their Royal Melbourne Technical College which has a comprehensive equipment for short and diploma courses in refrigerating engineering. Furthermore, the lec-

turers and instructors in this branch are very competent and are members of the Institute.

Some pleasing news about Australia has just been issued by the Federal parliamentary secretary for trade, Mr. Swartz. Since the war Australian factories had turned out 1,500 new products and many were appearing on world markets, he said, Australian cars were selling in Singapore, Malaya, Thailand, Hong Kong and many other countries.

Australian plastic footwear was selling in the United States and 40 other countries. There was also an increasing flow of exported goods, including fashion wear, sporting equipment, railway rolling stock, heavy machinery and electrical equipment, also cargo vessels for the Commonwealth Shipping Line.

#### Best Export Season for Apples and Pears

The Australian apple and pear industry has just completed the most successful export season in its history. During this 1958 season, Australia has shipped 5,500,000 bushel cases of apples and 1,400,000 bushel cases of pears to Britain and the Continent worth £9,500,000. This compared with 3,400,000 cases of apples and 1,100,000 cases of pears valued at £6,000,000 shipped in the previous season.

This season's increase was very noticeable, particularly in the pear-growing districts of Victoria, where cool storage facilities were loaded to capacity for a couple of months during the peak. At Harcourt, where the 16 × 6,000 case-capacity fruit-cool rooms were destroyed by fire in December last, the company was fortunate in

being able to have 5 × 8,500 case-capacity cool rooms re-built very quickly and equipped with grid type ceiling coils in time to secure late pears and apples from shareholders for holding on long storage.

The cool rooms are of timber construction for walls, floor and ceiling, each 52-ft. long × 26-ft. wide × 12-ft. high, insulated as a complete envelope with 5-in. of glass fibre and vapour-proofed with Visqueen plastic sheet. The roof is of steel truss formation carried on steel posts. Johns & Lyng carried out the building work, Gordon Bros. Pty. the refrigeration equipment.

The fishermen of the eastern States of Australia are up in arms in connexion with what they claim is low-priced fish from overseas. The New South Wales Government has been requested to advance sufficient money so that the fishing co-operative companies can build large cold stores to hold fish over glut periods.

In Tasmania, the Fish Canneries of Tasmania Pty. Ltd., will close its three canneries at Margate, Dunalley and Bridport soon and will offer them for sale. This firm recently sold its other two canning factories at Devonport and Launceston, and its ancillary activities, such as quick-frozen scollops and the export of crayfish tails to U.S.A. also will be discontinued. The reason given for the decision is the large quantity of canned fish now being imported into Australia.

Following on the statement by United States meat company executive (Mr. R. S. Griffith) that a proposed 10,000,000 dollar a year meat processing plant would not be established here because export quotas for the U.S. were not available, the Minister for Primary Industry, Mr. McMahon, has denied that the Commonwealth Government or the Australian Meat Board were creating unnecessary obstacles to the development of Australian meat packing or meat exports to the United States or any other country. Exports of meats from Australia to the United States this year reached nearly 10,000 tons, which would be an all-time record for that market from this country. Mr. McMahon said the quantities of Australian meat that could be exported to countries other than the United Kingdom were limited by the terms and conditions of the 15-year meat agreement between the two countries.

The agreement had been a valuable one and a real incentive to increased production, which had increased from 650,000 tons before the agreement in 1950-51 to about 800,000 tons last year; it also assured Australia minimum prices for the whole of its exportable surplus of beef, mutton and lamb for the 15-year period. Under this arrangement, Australia had received a cash payment from the U.K. Government of nearly

£A10,000,000 in addition to the U.K. market price in the last three years.

It was not generally known that United States law prevented U.S. ships from victualling with other than meats of United States origin. American vessels which called into Australian ports were even prohibited under U.S. law from taking on Australian supplies for the return voyage.

The chairman, Mr. A. L. Slade, of Kelvinator Australia Ltd., said in his annual report released last week, that competition in the refrigeration market was severe, but, aided by the new range of cabinets introduced in April, 1957, they had achieved a satisfactory volume of business in its year to March 31. Refrigerator stocks held by distributors and retailers were reduced considerably during the year, and consequently the company commenced the current year in a stronger position. Sales of room air-conditioners increased during 1957-58, and interest in the product developed rapidly throughout the year. Steady 15 per cent. ordinary dividend (which includes 5 per cent. bonus) takes with preference charges £164,075 from net profit of £237,632.

The Melbourne City Council has at last accepted a tender for a new fish market at £323,843 to be built on a portion of land reclaimed from the port and fronting a new road. It is estimated that the total cost, including land, will be about £479,653. The old market will be demolished and arranged for an off-street parking area.

#### Corio Freezing Works

This large meatworks situated at Corio Bay, Geelong, Victoria, and owned by the Geelong Harbour Trust, and which had been operated for many years by Sims Cooper Pty. Ltd., meat exporters on a large scale, have decided not to renew the lease, and concentrate on their very large meatworks at Newport, closer to Melbourne, where extensive alterations and additions to buildings and equipment are being carried out.

The killing capacity of the Corio works is up to 10,000 lambs per day on multiple chain systems, and there are facilities for beef, mutton, and pork. Total cold storage capacity is upward of 300,000 carcasses, with direct conveyor despatch to vessels alongside adjacent berths. Draft for vessels is 30-ft. There are also complete facilities for usual by-product treatment. It is understood that a Melbourne meat company will be taking up the lease.

#### Vestey Meatworks, Port Darwin

The old meatworks at Port Darwin in the Northern Territory, out of commission for many years, are being demolished by the Commonwealth Government.



# "PASSING OFF"

By LORD MESTON

IT is a civil wrong to pass off one's goods or business as the goods or business of another. This takes the form of selling merchandise or carrying on business under such a name, mark, description or otherwise in such a manner as to mislead the public that the merchandise or business is that of another person.

To establish a case of "passing off" proof of an intention to deceive is not essential. It is sufficient to prove that the practice complained of is of such a nature that it is likely in the ordinary course of business to deceive the public. Therefore it is not necessary to show that there is any likelihood of deception of the immediate purchasers. It is no defence for a person, who has been "passing off" someone else's goods as his own, to say that an observant person who made careful examination would not be misled. In considering whether deception is probable, account is to be taken not of the expert purchaser but of the ordinary ignorant and unwary member of the public.

It is immaterial whether the false representation about the merchandise or business is made expressly in words or impliedly by the use or imitation of a mark, trade name, or get-up with which the goods or business of another person are associated in the minds of the public.

There are several kinds of passing off. Some of the more common may be described as follows:—

(1) The direct statement that the merchandise or business of A is that of B.

(2) A more subtle type of deception by trading under a name so closely resembling another name as to mislead the public. For example, the Universal Life Assurance Society were granted an injunction to prevent a company subsequently incorporated from carrying on a business under the name of the Universal Life Assurance Association.

(3) Where a person uses or imitates the trade name or trade description by which someone else's goods have become known to the public. A trade name means a name under which goods are made or sold by a certain person, and which by established usage has become known to the public as indicating that those goods are the goods of that person. It is not necessary for the injured person to show that he is himself known to the public by name. All that is necessary is to show that his goods have become known by the particular name

or description in question as the goods of a particular manufacturer. Thus, the words "Yorkshire Relish" were held to have become known as meaning sauce of a particular manufacture, and the plaintiff in the action for "passing off" these goods was held entitled to succeed, although purchasers did not in fact know his name in connexion with the sauce at all.

But a trade name must be distinguished from a merely descriptive name. The latter is also a name under which goods are sold, but which merely indicates the nature of the goods, and not that they are the merchandise of any particular person. Accordingly, a person cannot be restrained from using some purely descriptive expression. Everyone has a right to the ordinary use of the English language. For example, a brewer who puts on his bottles a label with the words "nourishing stout" is not entitled to restrain another brewer from using the same or similar words on his labels. Again, there can be no restriction on the use of a word which merely describes the substance from which an article is manufactured. Thus the word "naphtha" cannot be monopolized by one soap-maker, but may be employed by anyone engaged in the trade.

As for business names, a person may adopt any name for trading purposes, provided that it is not already appropriated. In the case of a company, it is provided that the Board of Trade may prohibit the registration of companies under names the Board disapproves of; and the Board of Trade has power to require a change of name if, in fact,

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a new company is allowed a name "too like" that of an old one. As a general rule any person may trade in his own name, or use it as part of his business name, provided he does so honestly. But the right to do so is not absolute. The question in each case is whether the use of the name is calculated to deceive the public unless precautions are taken.

In every case the element of confusion is essential. That is to say, the public must be led to confuse the business or goods of A with the business or goods of B. The element of confusion necessitates comparison, and there must be a common field of activity in which both A and B are engaged. By way of example, we may refer to the actual case where A had acquired a very wide reputation as broadcaster of children's programmes under the fancy name of "Uncle Mac." On the other hand, B was engaged in producing and marketing puffed wheat under the same fancy name. It was held that as the famous broadcaster was not engaged in producing or marketing puffed wheat, there was no field of activity common to both parties. Therefore the producer and marketer of puffed wheat had not passed off the goods or business of the broadcaster of children's programmes.

(4) A similar form of argument may arise in connexion with a "trade mark." This is any mark habitually attached by a trader to goods manufactured or sold by him in order to indicate that they are his merchandise, and by established usage known to the public as possessing that significance. The wrong of "passing off" is committed when a person sells goods with the trade mark of another or any deceptive imitation attached to the goods. It may be noted that trade mark legislation has established a register of trade marks and provided for legal proceedings based on such registration. However, the remedy for "passing off" (to which we will refer later) is in addition to, and not in place of, any remedy which the proprietor of a registered trade mark may possess under the Trade Marks Act.

(5) To imitate the get-up or appearance of a person's goods so as to deceive the public is a very subtle type of "passing off." This may take the form of passing off inferior goods by circulating catalogues copied from those of another person.

(6) Selling second-hand goods as new goods manufactured by another person.

In an action at law for "passing off," the remedies may be (a) an injunction restraining further passing off, (b) damages, or, alternatively, an account of profits, and (c) an order for the delivery up of the offending articles or for otherwise dealing with them. Where damages are recoverable they may include damages to the trade reputation of the injured party.

The above-mentioned remedies for "passing off" are in addition to, and not in place of, any remedies which may also exist in respect of infringement of the statutory rights of patentees, the proprietors of registered designs, or the proprietors of registered trade marks. It may happen that if registration has been impossible, or has been carelessly omitted, the above-mentioned common law remedies of "passing off" adequately protect a trader whose business is subjected to competition of an unfair character. In conclusion, there can be no action for "passing off" unless there is interference with another person's trade, either actual or potential.

## REFRIGERATION PATENTS

These new refrigerating patents have been specially selected for readers by MODERN REFRIGERATION from the Official *Journal of Patents*, and are published by permission of the Controller of H.M. Stationery Office.

### APPLICATIONS RECEIVED

July 8—United-Carr Fastener Corporation, C21931, Refrigerator assemblies, etc.; Wimpey & Co. Ltd., G., and Raynham, E. A., P21585, Insulating material. 14—United Aircraft Corporation, Brahm, C. B., C22524, Aircraft air-conditioning system. 15—Fingscheidt G.m.b.H., F., Lock, W., C22605, Refrigerating cabinets, etc., locks; Ranco, Inc., C22610, Refrigerating systems' control mechanism. 16—Chierregatti, L., C22824, C22825, Air-conditioning apparatus. 17—Radio Heaters Ltd., Tibbs, C. E. M., P22989, Frozen foodstuffs defreezing methods; Westinghouse Electric International Co., C22950, Refrigeration apparatus. 18—General Electric Co., C23128, Insulation material; General Electric Co. Ltd., Cross, H., P23095, Thermally insulating handles; General Motors Corporation, C23101, Ice-block release arrangement; General Motors Ltd., Playle, J. R., P23099, Refrigerator compressor. 19—Robbins, A. A., C23229, Refrigerating, etc., package. 22—Hall & Kay Ltd., Brooks, A. J., and Hall, H. D., P23426, Air-conditioning apparatus. 24—Daimler-Benz Akt.-Ges., Strump, E., and Strifer, P., C23932, Motor vehicles' air-conditioning installations.

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